

SERVICE MANUAL

1610B

LOGIC STATE ANALYZER





SERVICE MANUAL

MODEL 1610B LOGIC STATE ANALYZER

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed **2024A**.

With changes described in Section VII, this manual also applies to instruments with serial numbers prefixed **2022A** and below.

© COPYRIGHT HEWLETT-PACKARD COMPANY/COLORADO SPRINGS DIVISION 1980
1900 GARDEN OF THE GODS ROAD, COLORADO SPRINGS, COLORADO, U.S.A.

ALL RIGHTS RESERVED

Manual Part Number 01610-90915
Microfiche Part Number 01610-90815
Operating Guide Part Number 01610-90916

PRINTED: JUNE 1980

SAFETY SUMMARY

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Hewlett-Packard Company assumes no liability for the customer's failure to comply with these requirements.

GROUND THE INSTRUMENT.

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument is equipped with a three-conductor ac power cable. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE.

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

KEEP AWAY FROM LIVE CIRCUITS.

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

DO NOT SERVICE OR ADJUST ALONE.

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

USE CAUTION WHEN EXPOSING OR HANDLING THE CRT.

Breakage of the Cathode-ray Tube (CRT) causes a high-velocity scattering of glass fragments (implosion). To prevent CRT implosion, avoid rough handling or jarring of the instrument. Handling of the CRT shall be done only by qualified maintenance personnel using approved safety mask and gloves.

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT.

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification of the instrument. Return the instrument to a Hewlett-Packard Sales and Service Office for service and repair to ensure that safety features are maintained.

DANGEROUS PROCEDURE WARNINGS.

Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

WARNING

**Dangerous voltages, capable of causing death, are present in this instrument.
Use extreme caution when handling, testing, and adjusting.**

TABLE OF CONTENTS

Section	Page	Section	Page
I GENERAL INFORMATION	1-1	5-5. Equipment Required	5-1
1-1. Introduction	1-1	5-7. Adjustments	5-1
1-4. Specifications	1-1	5-10. Adjustment Procedures	5-1
1-6. Instruments Covered by this Manual	1-1	5-11. +5 V, -5.2 V Power Supply Voltage Adjustment	5-2
1-11. Description	1-1	5-12. +5 V, -5.2 V Current Limit Adjustment	5-3
1-17. Options	1-2	5-13. Power Fail Adjustment	5-5
1-19. Accessories Supplied	1-2	5-14. Display Adjustment	5-6
1-21. Accessories Available	1-2	5-15. Strobe Adjustments	5-8
1-23. Recommended Test Equipment	1-2		
II INSTALLATION	2-1	VI REPLACEABLE PARTS	6-1
2-1. Introduction	2-1	6-1. Introduction	6-1
2-3. Initial Inspection	2-1	6-3. Abbreviations	6-1
2-5. Preparation for Use	2-1	6-5. Replaceable Parts List	6-1
2-6. Power Requirements	2-1	6-7. Ordering Information	6-1
2-7. Line Voltage Selection	2-1	6-10. Direct Mail Order System	6-1
2-8. Power Cable	2-1	VII MANUAL CHANGES	7-1
2-9. Probe Installation	2-2	7-1. Introduction	7-1
2-10. Printer Interface	2-2	7-3. Manual Changes	7-1
2-11. Repacking for Shipment	2-2		
III OPERATION	3-1	VIII SERVICE	8-1
IV PERFORMANCE TESTS	4-1	8-1. Introduction	8-1
4-1. Introduction	4-1	8-4. Principles of Operation	8-1
4-3. Equipment Required	4-1	8-6. Logic Convention	8-1
4-5. Performance Test Record	4-1	8-7. Mnemonics	8-1
4-7. Operation Verification	4-1	8-8. Troubleshooting	8-1
4-9. ROM/RAM Test	4-1	8-12. Operation Verification	8-1
4-10. Display Test	4-2	8-13. 1610B Basic Block Diagram Description	8-1
4-11. Keyboard Test	4-3	8-15. Power Supply	8-1
4-12. Trace Test	4-4	8-16. Control and I/O	8-9
4-13. Interrupt Test	4-5	8-18. Display	8-9
4-14. Printer Test	4-5	8-19. Data Acquisition	8-9
4-15. Performance Verification	4-5	8-23. Basic Block Diagram Troubleshooting	8-9
4-17. Input Threshold and Minimum Input Swing Test	4-6	8-29. Power Supply Block Diagram Description	8-10
4-18. Input Threshold Range Test	4-8	8-33. Power Supply Block Diagram Troubleshooting	8-10
4-19. Minimum Clock Width Test	4-10	8-35. Control and I/O Block Diagram Description	8-11
4-20. Data Setup and Hold Time Test ..	4-12	8-36. Control Section	8-11
4-21. Qualifier Setup and Hold Time Test	4-14	8-39. I/O Section	8-11
4-22. Trigger and Measurement Enable Output Test	4-16	8-45. Control and I/O Block Diagram Troubleshooting	8-12
V ADJUSTMENTS	5-1	8-56. Display Block Diagram Description	8-14
5-1. Introduction	5-1	8-64. Display Block Diagram Troubleshooting	8-15
5-3. Safety Requirements	5-1		

LIST OF ILLUSTRATIONS

Figure	Title	Page	Figure	Title	Page
2-1.	Line Voltage Selection	2-1	7-1.	Replacement for Paragraph 5-15	7-8
2-2.	Power Cables Available	2-1	7-2.	Replacement for Figure 8-11	7-9
2-3.	Probe Installation	2-2	7-3.	Replacement for A9 Component Locations	7-10
4-1.	Display Test	4-2	7-4.	Replacement for Figure 8-13 (Sheet 2 of 6)	7-11
4-2.	50-ohm Test Connector	4-5	7-5.	Replacement for Figure 8-13 (Sheet 6 of 6)	7-13
4-3.	Input Threshold and Minimum Input Swing Test Setup	4-6	7-6.	Replacement for Figure 6-1 (Sheet 2 of 2)	7-15
4-4.	Input Threshold and Minimum Swing Test Waveform	4-7	7-7.	Replacement for Figure 8-8 (Sheet 1 of 2)	7-16
4-5.	Input Threshold Range Test Setup	4-6	7-8.	Replacement for Figure 8-8 Service (Sheet 2 of 2)	7-17
4-6.	Input Threshold Range Test Waveform	4-9	7-9.	Replacement for A10 Component Locations (01610-66535)	7-18
4-7.	Minimum Clock Width Test Setup	4-10	7-10.	Replacement for Figure 8-9 (Sheet 2 of 4)	7-19
4-8.	Minimum Clock Width Test Waveform	4-11	8-1.	1610B Basic Block Diagram	8-9
4-9.	Data Setup and Hold Time Test Setup	4-12	8-2.	Block Diagram, 1610B Power Supply	8-10
4-10.	Data Setup and Hold Time Test Waveform	4-13	8-3.	Block Diagram, 1610B Control and I/O Section	8-13
4-11.	Qualifier Setup and Hold Time Test Setup	4-14	8-4.	Block Diagram, 1610B Display Section	8-15
4-12.	Qualifier Setup and Hold Time Test Waveform	4-15	8-5.	Block Diagram, 1610B Data Acquisition Section	8-17
4-13.	Trigger Output Test Setup	4-16	8-6.	Service Sheet 1, Mother Board A11	8-18
4-14.	Trigger Output Pulse	4-17	8-7.	Service Sheet 2, Tap Changer Board A14 ..	8-20
4-15.	Measurement Enable Output Test Setup ...	4-17	8-8.	Service Sheet 3, 5-Volt Power Supply A18 ..	8-21
5-1.	+5 V, -5.2 V Voltage and Current Limit Adjustment Locations	5-2	8-9.	Service Sheet 4, Low-Voltage Power Supply Board A10	8-24
5-2.	Power Supply Test Load	5-3	8-10.	Service Sheet 5, Keyboard Assembly A12	8-28
5-3.	Power Fail and 15 kV Adjustment Locations	5-5	8-11.	Service Sheet 6, MPU/IO Board A6	8-30
5-4.	Display Adjustment Locations	5-6	8-12.	Service Sheet 7, Display Control Board A5	8-36
5-5.	Display Adjust Waveform	5-7	8-13.	Service Sheet 8, Display Driver Board A9	8-44
5-6.	Strobe Adjustment Locations	5-9	8-14.	Service Sheet 9, State Recognition Board A1	8-50
5-7.	A1 Test Point Location	5-10	8-15.	Service Sheet 10, Index Board A2	8-56
5-8.	Term and Write Adjust Waveform	5-11	8-16.	Service Sheet 11, Measurement Board A3 ..	8-62
5-9.	Add Adjust Waveform	5-11	8-17.	Service Sheet 12, Probe Driver Board A16	8-70
5-10.	Read Adjust Waveform	5-12			
5-11.	Count Adjust Waveform	5-12			
6-1.	Illustrated Parts Breakdown	6-3			

LIST OF TABLES

Table	Title	Page	Table	Title	Page
1-1.	Specifications	1-2	6-1.	Reference Designators and Abbreviations	6-2
1-2.	Supplemental Characteristics	1-2	6-2.	Replaceable Parts	6-5
1-3.	Recommended Test Equipment	1-4	6-3.	List of Manufacturers' Codes	6-29
4-1.	Key Codes	4-3	7-1.	Replacement for Table 6-1	7-5
	Performance Test Record	4-19	8-1.	1610B Schematic Functional Breakdown	8-0
5-1.	Adjustable Components	5-1	8-2.	1610B Mnemonics	8-2
			8-3.	Schematic Diagram Notes	8-18

SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION.

1-2. This Operating and Service Manual contains information required to install, test, and service the Hewlett-Packard Model 1610B Logic State Analyzer. Operating instructions are provided in a separate Operating Guide supplied with the instrument. It should be kept with the instrument for use by the operator. The part number of the guide is listed on the title page of this manual.

1-3. Also listed on the title page is a microfiche part number. This number can be used to order 4 x 6-inch microfilm transparencies of the manual. Each microfiche contains up to 96 photo-duplicates of the manual pages. The microfiche package also includes the latest Manual Changes supplement.

1-4. SPECIFICATIONS.

1-5. Instrument specifications are listed in table 1-1. These specifications are the performance standards or limits against which the instrument is tested. Supplemental characteristics in table 1-2 are not specifications but are included as additional information for the user.

1-6. INSTRUMENTS COVERED BY THIS MANUAL.

1-7. Attached to the instrument is a serial number tag. The serial number is in the form: 0000A00000. It is in two parts; the first four digits and the letter are the serial prefix, and the last five digits are the suffix. The prefix is the same for all identical instruments. The suffix, however, is assigned sequentially and is different for each instrument. The contents of this manual apply to instruments with the serial number prefix(es) listed under SERIAL NUMBERS on the title page.

1-8. An instrument manufactured after the printing of this manual may have a serial number prefix that is not listed on the title page. This unlisted serial number prefix indicates that the instrument is different from those described in this manual. The manual for this newer instrument is accompanied by a Manual Changes supplement. This supplement contains "change information" that explains how to adapt the manual for the newer instrument.

1-9. In addition to change information, the supplement contains information for correcting errors in the manual. To keep this manual as current as possible, Hewlett-Packard recommends that you periodically request the latest Manual Changes supplement. The supplement for

this manual is identified with the manual print date and part number, both of which appear on the manual title page. Complimentary copies of the supplement are available from Hewlett-Packard.

1-10. For information concerning a serial number prefix that is not listed on the title page or in the Manual Changes supplement, contact your nearest Hewlett-Packard Office.

1-11. DESCRIPTION.

1-12. The Model 1610B is a general-purpose, keyboard-controlled, logic state analyzer offering ease and convenience in the analysis of complex state machines. The 1610B synchronously performs real-time trace and count measurements at up to 10-MHz rates. Input states are sensed through high-impedance probes grouped into four 8-bit pods with a fifth pod for clocks and clock qualifiers. Each pod may be separately preset to TTL logic threshold or variably adjusted in the range of ± 10 volts.

1-13. The 1610B has three data display modes: Trace List, Trace Graph, and Trace Compare. The Trace List display mode provides a tabular listing of states in the order of their occurrence. Twenty trace states (one per line) are displayed on screen, and "roll" keys allow viewing of the entire 64-state listing. The Trace Graph display mode presents a graph of data magnitude versus time for all 64 states. Each state is shown as a dot with a vertical displacement corresponding to its binary magnitude with an increasing horizontal displacement for successive states in the order of their occurrence. The result is a waveform analogous to oscilloscope voltage magnitude displays. The Trace Compare display mode presents a tabular listing of the differences between results in the present measurement and a stored measurement. The listing is formatted and rolled in the same manner as the Trace List. Results of the two measurements are exclusive ORed, and identical bits are displayed as zeros.

1-14. Input data is gathered at the active edge of the specified qualified clock and treated as one parallel state. Trace measurement is a collection of these state values as they occur. Trace position may be selected to start, center, or end where the input data satisfies the specified state sequence. A state sequence is one to seven state conditions which must be found in the sequence specified by the operator. Intermediate steps not satisfying the sequence are ignored. Sections of branched, looped, or nested forms of state flow may be directly located by state sequences.

1-15. The trace measurement may be further qualified by specifying which occurrence of the state is to be found. Each state in a state sequence may be specified to occur from 1 to 65 536 times. This specification will locate the nth pass of a loop beginning at the specified state.

1-16. The 1610B performs time and state counting measurements in absolute and relative modes. It displays time or the number of count states occurring between each state from the trace position in the absolute mode and between each traced state in the relative mode. Time measurements have a range of 0 to 429 seconds with 0.1% accuracy and 100 ns resolution. State counts have a range of 0 to 4 294 967 295.

1-17. OPTIONS.

1-18. The following options are available for the 1610B:

Option 003: Model 1610B with HP-IB (Hewlett-Packard Interface Bus) capability; provides remote control of front-panel functions. A separate Operating and Service Manual Supplement is supplied with the option.

Option 004: Model 1610B with Model 9876A Thermal Printer (includes Interface Cable, HP Part No. 01610-61637); provides hard copy of measurement specifications and data.

1-19. ACCESSORIES SUPPLIED.

1-20. The following accessories are supplied with the 1610B:

Five 8-bit Data Probes (HP Model 10248B or 10248C)
 One 2.3 m (7.5 ft) Power Cable (refer to Section II)
 One Extender Board (HP Part No. 01610-66519)
 Four Extender Cables as follows:
 16-pin (HP Part No. 01610-61621)
 14-pin (HP Part No. 01610-61622)

High Speed (HP Part No. 01610-61623; 3 connectors)
 High Speed (HP Part No. 01610-61624; 2 connectors)
 Ten Adapters, two-to-one demultiplexing (HP Part No. 5061-3613).

1-21. ACCESSORIES AVAILABLE.

1-22. The following accessories are available for the 1610B:

Model 10275A PDP-11 Unibus Interface provides easy connection between a 1610B and a Digital Equipment Corporation PDP-11 Minicomputer.

Model 10276A LSI-11 Q-Bus Interface provides easy connection between a 1610B and a Digital Equipment Corporation LSI-11 Minicomputer.

Model 10277A General Purpose Probe Interface provides a convenient method of connecting a 1610B to digital systems.

Model 10278A HP 1000 Series Interface provides easy connection between a 1610B and an HP 1000 Series Minicomputer.

Model 10279A Nova 31 Interface provides easy connection between a 1610B and a Data General Nova 31 Minicomputer.

Model 10280A Micro-Nova Interface provides easy connection between a 1610B and a Data General Micro-Nova Minicomputer.

Model 52126A Intel Multibus Interface provides easy connection between a 1610B and an Intel Minicomputer.

Probe Lead Kit (HP Part No. 10248-69501) provides a set of 12 probe lead cables and a connector clip for one 10248B or 10248C probe.

Probe Tips (HP Part No. 10230-62101) for use with extra probe lead kits or as replacement tips.

1-23. RECOMMENDED TEST EQUIPMENT.

1-24. Equipment required to maintain the Model 1610B is listed in table 1-3. Other equipment may be substituted if it meets or exceeds critical specifications listed in the table.

Table 1-1. Specifications

PROBE INPUTS

INPUT RC: approx 50 k Ω shunted by approx 14 pF with 10248B probe or approx 100 k Ω shunted by approx 14 pF with 10248C probe at the probe tip.

INPUT BIAS CURRENT: ≤ 20 μ A.

MAXIMUM INPUT: -15 V to +15 V.

MINIMUM INPUT SWING: 0.6 V p-p.

INPUT THRESHOLD: TTL, fixed at approx +1.5 V; variable, ± 10 Vdc.

CLOCK INPUTS

MASTER CLOCK REPETITION RATE: to 10 MHz.

MINIMUM CLOCK WIDTH: 20 ns at threshold level.
 Master active edge to master active edge: 100 ns min.

Master active edge to next slave active edge: 20 ns min.

Slave active edge to next slave or master active edge: 0 ns min (see Multiple Clock Timing figure below).

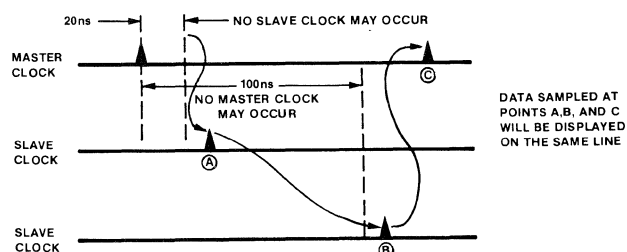


Table 1-1. Specifications (Cont'd)

DATA AND QUALIFIERS INPUTS

SETUP TIME, DATA AND QUALIFIERS (Including Don't Care): Time qualifiers and data must be present prior to active edge of clock, 20 ns max.

HOLD TIME, DATA AND QUALIFIERS (Including Don't Care): Time qualifiers and data must remain present and stable after active edge of clock, 0 ns.

NOTE

Ground unused qualifier inputs to prevent stray pickup.

TRIGGER AND MEASUREMENT ENABLE OUTPUTS

TRIGGER OUTPUT (Rear Panel). The 50 ns ± 10 ns positive TTL trigger pulse is generated each time the trace position is recognized. If the trace includes a word sequence, the pulse occurs when the last word is found. The trigger output pulses will continue on each occurrence of the trigger after a trace

has been initialized unless either the STOP key or the FORMAT SPECIFICATION key is pressed. If either of these keys is pressed, the trigger output will be disabled (low) until the TRACE key is pressed. Whenever the TRACE key is pressed, the 1610B initializes the data acquisition circuitry before starting the trace. During initialization time, the trigger output is disabled (low). If continuous trace or compared trace mode is selected, the trigger output will be disabled during the reinitialization period between traces.

MEASUREMENT ENABLE OUTPUTS (Rear Panel).

The positive TTL level measurement enable output (+) goes high and remains high when the 1610B is looking for trace position. It goes low when a trace position is recognized or if the STOP key is pressed. In continuous or compared trace modes, the transitions repeat each time the 1610B makes a new measurement. Measurement enable output (-) is the complement of measurement enable output (+).

Table 1-2. Supplemental Characteristics

GENERAL

MEMORY DEPTH: 64 data states; 20 states are displayed on screen, roll keys permit viewing all 64 data states.

COUNT TIME: resolution, 100 ns; accuracy, 0.01%. Maximum time, 429.4 seconds.

COUNT STATES: 0 to $2^{32} - 1$ events (4 294 967 295; decimal). Counts can be in either STATE or TIME. In TIME, count is in microseconds.

OCCURRENCE COUNT: 1 to 2^{16} (65 536; decimal).

POWER: 100, 120, 220, 240 Vac, -10% to +5%; 48 to 61 Hz; 260 VA max.

DIMENSIONS: see outline drawings.

OPERATING ENVIRONMENT

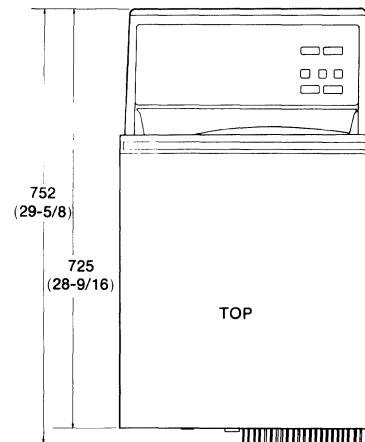
Temperature: 0° C to +55° C.

Humidity: up to 95% relative humidity at +40° C.

Altitude: to 4600 m (15 000 ft).

Vibration: vibrated in three planes for 15 min each with 0.25 mm (0.010 in.) excursions, 10 to 55 Hz.

WEIGHT: net, 26.5 kg (58.5 lb).

**NOTES**

1. DIMENSIONS ARE FOR GENERAL INFORMATION ONLY. IF DIMENSIONS ARE REQUIRED FOR BUILDING SPECIAL ENCLOSURES, CONTACT YOUR HP FIELD ENGINEER.
2. DIMENSIONS ARE IN MILLIMETRES AND (INCHES).

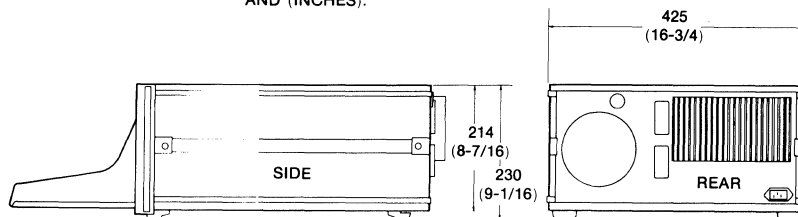


Table 1-3. Recommended Test Equipment

Instrument	Critical Specification	Recommended Model	Use*
Current Tracer		HP547A	T
Dual-channel Oscilloscope	100-MHz, dual channel, delayed sweep, time interval measurement, 0.1 ns resolution, 0.5 ns accuracy	HP1722B or HP1743A	P,A,T
Digital Voltmeter	4 digit, ± 1000 V, 0.1% accuracy	HP3465A	P,A,T
Pulse Generators (2)	± 10 V into 50 ohm, external trigger, adjustable delay	HP8013B	P
Logic Probe	Monitor digital signals	HP10525T	T
Logic Pulser	Pulse digital circuits	HP10526T	T
50-ohm Feedthroughs (2)		HP10100C	P
BNC-to-Alligator Clip Adapters (2)		HP Part No. 8120-1292	P
AC Current Probes (2)		HP1110A	T
*P=Performance Test; A=Adjustments; T=Troubleshooting.			

SECTION II

INSTALLATION

2-1. INTRODUCTION.

2-2. This section contains information for installing the Model 1610B. Included are initial inspection procedures, power and grounding requirements, and instructions for repacking the instrument for shipment.

2-3. INITIAL INSPECTION.

2-4. Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically. Procedures for checking electrical performance are given in Section IV. If the contents are incomplete, if there is mechanical damage or defect, or if the instrument does not pass the Performance Tests, notify the nearest Hewlett-Packard Office. If the shipping container is damaged, or if the cushioning material shows signs of stress, notify the carrier as well as the Hewlett-Packard Office. Keep the shipping materials for carrier's inspection. The HP office will arrange for repair or replacement at HP option without waiting for claim settlement.

2-5. PREPARATION FOR USE.

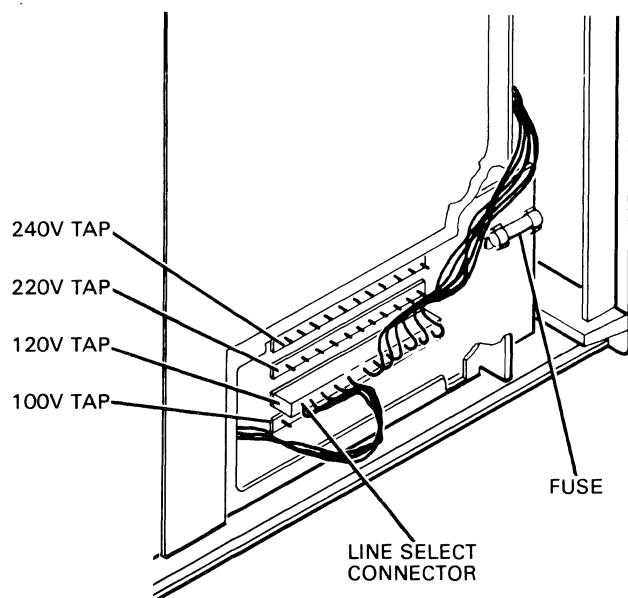
2-6. POWER REQUIREMENTS. The 1610B requires a power source of 100, 120, 220, or 240 Vac, -10% to +5%; single-phase, 48 to 61 Hz; 260 VA maximum.

CAUTION

The instrument may be damaged if the Line Voltage Selection Connector is not properly installed to match the input line voltage.

2-7. LINE VOLTAGE SELECTION. 100-, 120-, 220-, or 240-volt operation is selected by connecting the AC Line Voltage Selection Connector onto one of four taps inside the bottom cover of the instrument (see figure 2-1). To check or change positions of the Line Voltage Selection Connector, proceed as follows:

- a. Disconnect ac power cable.
- b. Remove bottom cover.
- c. Connect Line Voltage Selection Connector onto tap for desired voltage.
- d. For 100V or 120V operation, install 5A fuse (HP Part No. 2110-0010).



1610B BOTTOM VIEW

Figure 2-1. Line Voltage Selection

e. For 220V or 240V operation, install 3A fuse (HP Part No. 2110-0003).

f. Reinstall bottom cover.

2-8. POWER CABLE. This instrument is equipped with a three-wire power cable. When connected to an appropriate ac power receptacle, this cable grounds the instrument cabinet. The type of power cable plug shipped with each instrument depends on the country of destination. See figure 2-2 for part numbers of power cables and plug configurations available.

8120-2857		8120-1369	
8120-1351	8120-2104		8120-1378

Figure 2-2. Power Cables Available

2-9. PROBE INSTALLATION. Sockets for connecting clock and data probes are located under the keyboard (see figure 2-3). Pod numbers correspond with the format specification menu display. To connect probes, proceed as follows:

- a. Slide spring clip on probe plug to unlocked position.
- b. Hold probe plug with molded ridge on left and plug it into socket under keyboard.
- c. Slide spring clip on probe plug to locked position.

2-10. PRINTER INTERFACE. A printer connector on the rear panel permits interfacing the 1610B with an HP

Model 9866A or Model 9866B printer for obtaining hard copy of all display menus except graph. (HP Part No. for the Interface Cable is 09866-61630.)

2-11. REPACKING FOR SHIPMENT.

2-12. If the instrument is to be shipped to a Hewlett-Packard Sales/Service Office for service or repair, attach a tag showing owner (with address), complete instrument serial number, and a description of the service required.

2-13. Use the original shipping carton and packing material. If the original packing material is not available, the Hewlett-Packard Sales/Service Office will provide information and recommendations on materials to be used.

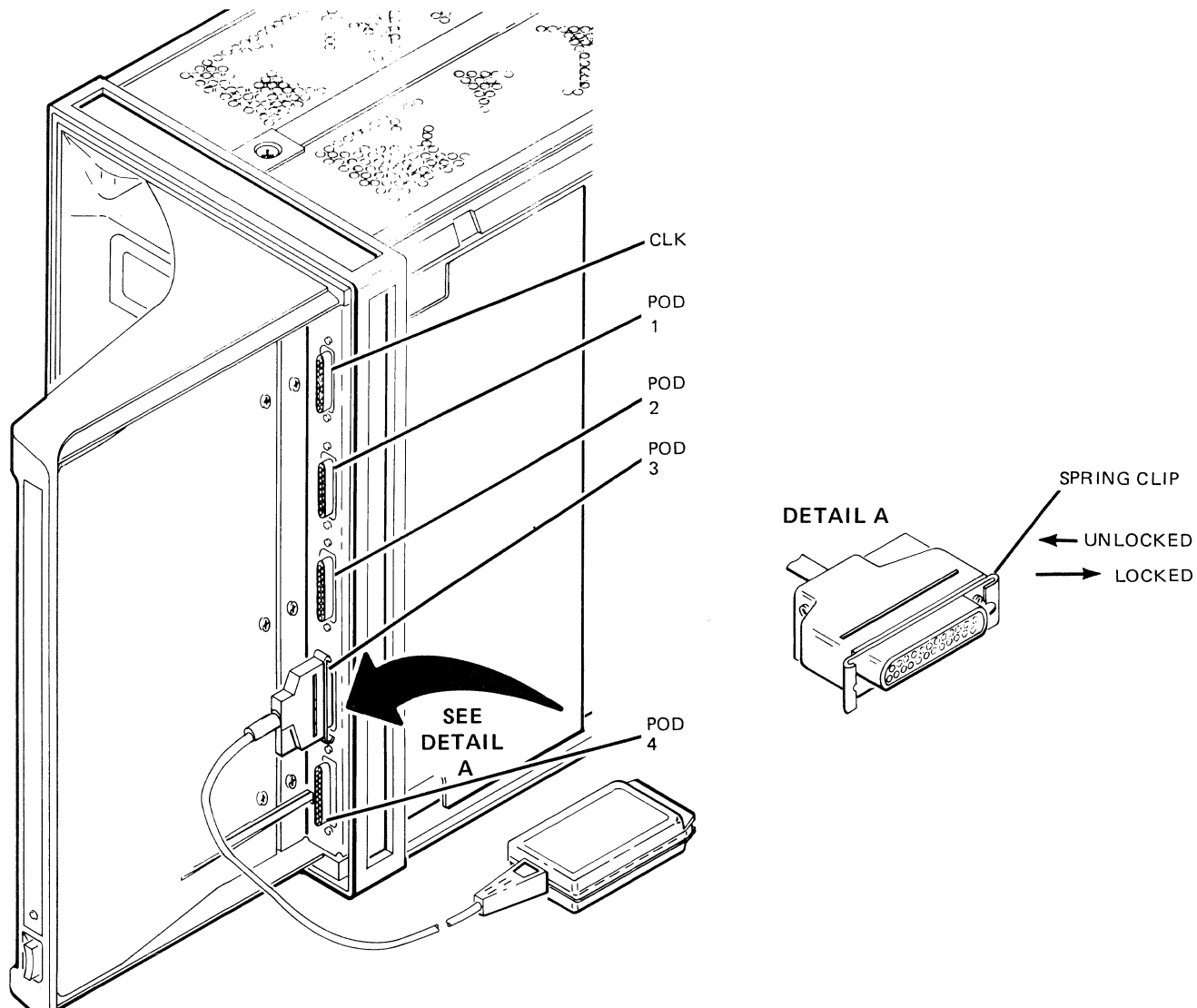


Figure 2-3. Probe Installation

SECTION III

OPERATION

Detailed operating information is provided in the 1610B Operating Guide supplied with the instrument.

SECTION IV

PERFORMANCE TESTS

4-1. INTRODUCTION.

4-2. This section provides two types of performance tests: Operation Verification and Performance Verification. The Operation Verification provides approximately 90% assurance that the 1610B and its input probes are functioning properly without testing all the specifications listed in table 1-1. The Performance Verification checks electrical parameters of the instrument using the specifications in table 1-1 as performance standards. Unless the detailed Performance Verification is required, it is recommended that only the Operation Verification be performed. All tests can be performed without access to the interior of the instrument.

4-3. EQUIPMENT REQUIRED.

4-4. Test equipment (required only for the Performance Verification) is listed in the Recommended Test Equipment table in Section I. Any equipment that satisfies the critical requirements given in the table may be substituted for the recommended model(s).

4-5. PERFORMANCE TEST RECORD.

4-6. Performance Test results may be recorded in the Performance Test Record at the end of this section. The test record lists all tested specifications and their acceptable limits. Test results recorded at incoming inspection can be used for comparison in periodic maintenance and after repairs or adjustments.

4-7. OPERATION VERIFICATION.

4-8. To verify that the Logic State Analyzer is performing properly without testing all specifications listed in table 1-1, the Operation Verification is recommended. This procedure consists of six internal tests: ROM/RAM, Display, Keyboard, Trace, Interrupt, and Printer. To initiate these tests, the 1610B must first be put into the self-test mode. Pressing the START button on the rear panel will automatically run the ROM/RAM test and place the 1610B in the self-test mode. Repeated pressing of the FIELD SELECT key may then be used to select the desired test. To abort the self-test mode, the DEFAULT key may be pressed at the end of any test. Each test is controlled and evaluated by the microprocessor in the 1610B. The results of each test are then displayed on screen by the microprocessor.

4-9. ROM/RAM TEST.

DESCRIPTION:

This test verifies proper operation of the microprocessor; ROMs A6U17 thru U24; RAMs A5U1, U2, U5, U6, U9, U10, U13, U14; and associated microprocessor interface circuits. Microprocessor ROM circuits are checked with a checksum subroutine. The RAMs are tested by first writing a portion of data contained in ROM into the RAM then reading it back and comparing it to the data contained in ROM. During ROM/RAM test, the 1610B screen is filled with random characters. When the test has passed, the 1610B will beep and the display test will be shown on screen. If the ROM/RAM test fails, the microprocessor continuously repeats the test. This will result in a cycling display of random characters.

PROCEDURE:

- a. Set LINE switch to on position.
- b. Press START button on rear panel of 1610B.
- c. Verify that 1610B beeps one time $\approx$ 2 seconds after START button is released.

PERFORMANCE TESTS

4-10. DISPLAY TEST.

DESCRIPTION.

This test verifies proper operation of the CRT display. During the test, you can check display size, intensity ratio, and verify that all characters are displayed properly. The test may be repeated by pressing the TRACE key.

PROCEDURE:

- Set LINE switch to on position.
- Press START button on rear panel of 1610B.
- Verify that display is as shown in figure 4-1 with "1610 VERIFICATION-COMPLETE" message in upper-right corner.

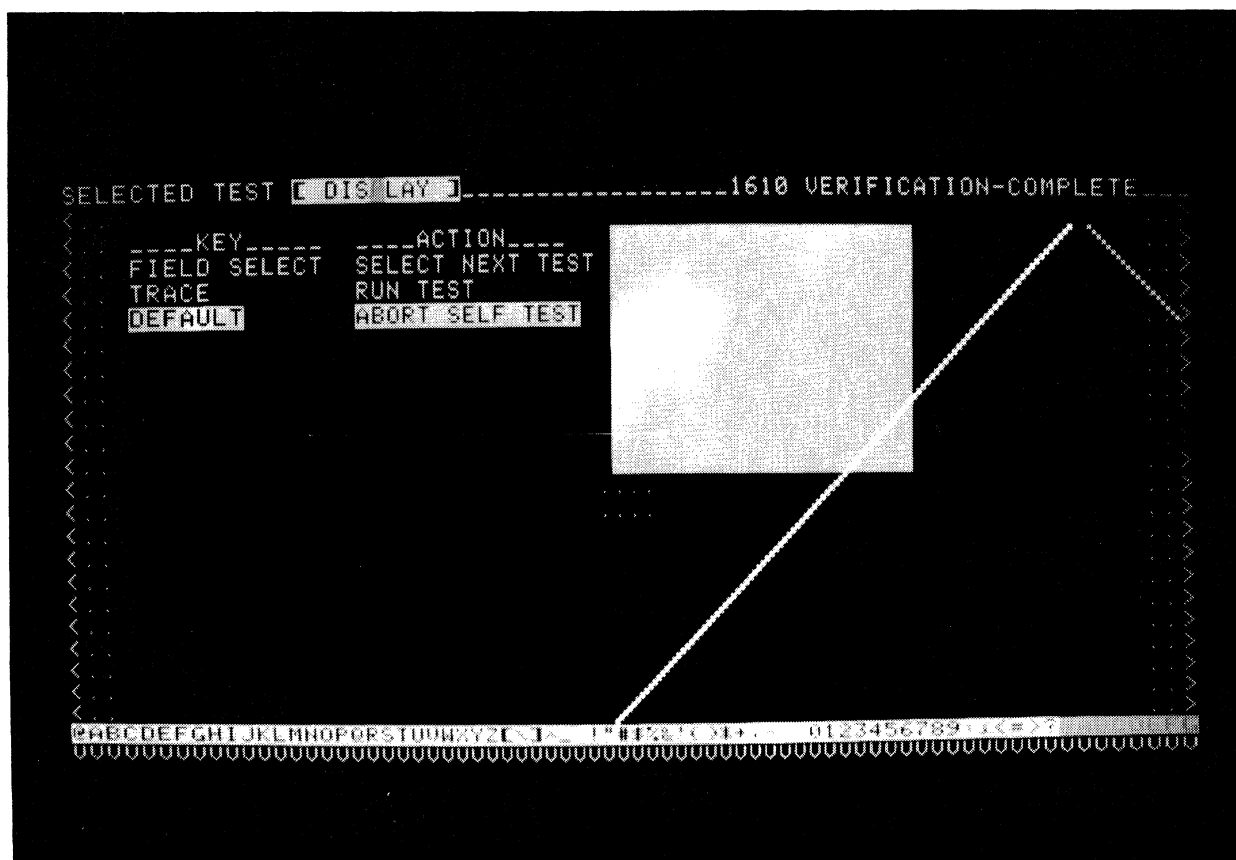


Figure 4-1. Display Test

PERFORMANCE TESTS

4-11. KEYBOARD TEST.

DESCRIPTION.

This test verifies that the 1610B detects each of the 39 keys on the keyboard. The keys are pressed one at a time in any order, but the FIELD SELECT key must be pressed last. After each key is pressed, the corresponding key code for that key is displayed (see table 4-1 for key codes). In addition, that key code is removed from the string of key codes that have not been detected (missing codes). When the FIELD SELECT key is pressed, the 1610B checks for any remaining key codes in the code string. If there are none, the test will pass. If any key codes remain in the string, the test will fail. After the key code test is completed, it can be restarted by pressing the TRACE key.

PROCEDURE:

- a. Set LINE switch to on position.
- b. Press START button on rear panel of 1610B.
- c. Press FIELD SELECT key repeatedly until Keyboard Test is selected and displayed.
- d. Press each key on the keyboard one at a time, ending with the FIELD SELECT key.
- e. Verify that "1610 VERIFICATION-COMPLETE" message is displayed.

Table 4-1. Key Codes

Key	Code	Key	Code
FORMAT SPEC	H	C	C
TRACE SPEC	I	D	D
LIST	J	E	E
GRAPH	K	F	F
COMPR vs STORE	L	DELETE	^
↓ ROLL	/	INSERT	□
↑ ROLL	.	DEFAULT	—
X	X	DECR	?
0	0	INCR	:
1	1	— CURSOR	&
2	2	↑ CURSOR	\$
3	3	↓ CURSOR	%
4	4	— CURSOR	,
5	5	↓ STORE	R
6	6	↑ ↓ SWAP	Q
7	7	PRINT	P
8	8	TRACE	S
9	9	STOP	T
A	A	[]	—
B	B		

PERFORMANCE TESTS

4-12. TRACE TEST.**SPECIFICATION:**

Master Clock Repetition Rate: to 10 MHz.

Master Active Edge to Master Active Edge: 100 ns min.

DESCRIPTION:

This test verifies proper operation of the data acquisition circuitry; this includes the clock and data probes as well as circuitry on the A1, A2, and A3 Assemblies. A data source is provided at the rear panel of the 1610B for use in the trace verification test. The clock rate from the rear-panel data source is 10 MHz. Therefore, the repetition rate specification in table 1-1 is checked during this test. During trace test, the microprocessor sets up various conditions in the trace and format specification menus, then commands the data acquisition circuitry to gather data. The microprocessor checks this data and displays results of the trace test on screen. These results are segmented so that each probe can be tested separately. When none of the probes are connected to the rear-panel data source, the 1610B will display "POD 4321 CT". This message indicates failure of the probe pod test. The "C" means that the clock pod test has failed. Circuits checked during the clock pod test are: multiple clock, clock qualifiers, and slow-clock detection. "T" means that the count time test has failed. "POD 4321" indicates that the respective data acquisition circuitry for each pod has failed the data acquisition test. When the clock probe is connected to the data source, the "C" and "T" indications should no longer be displayed. After the clock probe is connected and tested, each data probe can be tested one at a time. Each time a data probe is connected to the rear-panel data source, the pod number for that probe is no longer displayed, and test results are updated to indicate that the pod has passed the test. The trace test will be automatically repeated until all pods have passed the test or until the STOP key is pressed. The trace test may be run continuously by pressing the TRACE key. Once the TRACE key is pressed, the STOP key may be pressed to terminate continuous execution of the test.

PROCEDURE:

- a. Set LINE switch to on position.
- b. Set all front-panel POD THRESHOLD switches to TTL positions.
- c. Connect the clock probe and all four data probes to their respective connectors located under the keyboard.
- d. Press START button on rear panel.
- e. Press FIELD SELECT key repeatedly until Trace Test is selected and displayed on screen.
- f. With no pods connected to the rear panel, verify that "POD 4321 CT" is displayed.
- g. Connect clock probe pod to CLOCK OUTPUT pod connector on rear panel.
- h. Verify that "CT" is no longer displayed and that test results indicate "PASSED" for count time and clock pod.
- i. Without removing clock pod, connect one of the data pods to DATA OUTPUT pod connector on rear panel.
- j. Verify that the pod's number is no longer present and that test result for the respective pod number now indicates "PASSED".
- k. Repeat steps i and j for each remaining data probe.
- l. Verify that display indicates all pods have passed and that "1610 VERIFICATION COMPLETE" message is displayed.

PERFORMANCE TESTS

4-13. INTERRUPT TEST.

DESCRIPTION:

This test verifies proper operation of maskable interrupt circuitry on Microprocessor Board A6. When enabled, this circuitry generates interrupts at a fixed rate; the interrupt test verifies that the rate is correct. IC's involved in the test are: A6U7, U9A, U2, U46, U43, U28, and U26. Once this test is entered, pressing the TRACE key will result in continuous execution.

PROCEDURE:

- Set LINE switch to on position.
- Press START button on rear panel.
- Press FIELD SELECT key repeatedly until the Interrupt Test is selected and displayed.
- Verify that "1610 VERIFICATION-COMplete" message is displayed.

4-14. PRINTER TEST

DESCRIPTION:

This test checks printer interface circuitry and the 9866A/B Thermal Printer if one is connected. When a printer is connected, the 1610B will output the bottom line of the printer test. The printed line on the 9866A/B should be identical to the line shown at the bottom of the 1610B screen. The 1610B also displays the test results. Continuous execution of this test can be initiated with the TRACE key. To stop continuous execution, press the STOP key.

PROCEDURE:

- Set LINE switch to on position.
- Press START button on rear panel.
- Press FIELD SELECT key repeatedly until Printer Test is selected and displayed.
- When Printer Test is complete, verify that the printed line is identical to the line shown at the bottom of the 1610B display. If no printer is connected, it is only necessary to verify that "1610 VERIFICATION-COMplete" message is displayed on screen.

4-15. PERFORMANCE VERIFICATION.

4-16. The following procedures verify electrical parameters of the 1610B using specifications in table 1-1 as the performance standards.

NOTE

The Performance Verification requires that the probe inputs be connected to pulse generator outputs. A convenient connector that includes a 50 ohm termination for a pulse generator can be fabricated as shown in figure 4-2.

BNC connector	1250-0083
solder lug	0360-1632
nut	2950-0001
2 resistors, 1 watt, 100 ohms	0760-0024

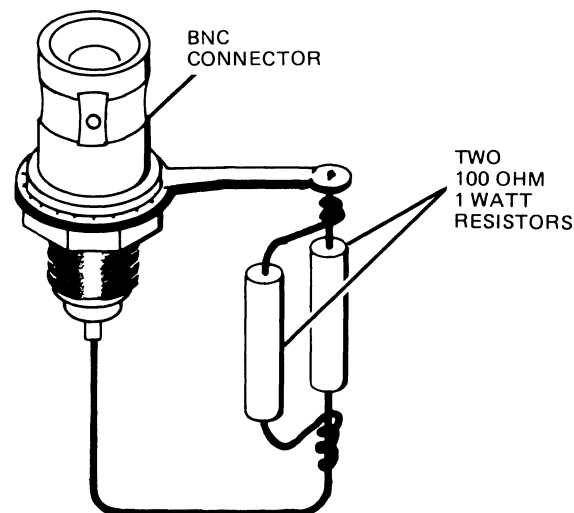


Figure 4-2. 50-Ohm Test Connector

PERFORMANCE TESTS

4-17. INPUT THRESHOLD AND MINIMUM INPUT SWING TEST.

SPECIFICATION:
Input Threshold: TTL fixed at approx +1.5 volts.
Minimum Input Swing: 0.6 volt peak-to-peak.

DESCRIPTION:
This procedure verifies that clock qualifier and data probe inputs recognize the proper state of a 1 or 0 when an input signal is compared with the threshold voltage. It also checks the 0.6 volt peak-to-peak minimum input swing specification.

EQUIPMENT:
Pulse Generator HP 8013B
Oscilloscope HP 1722B or HP 1743A

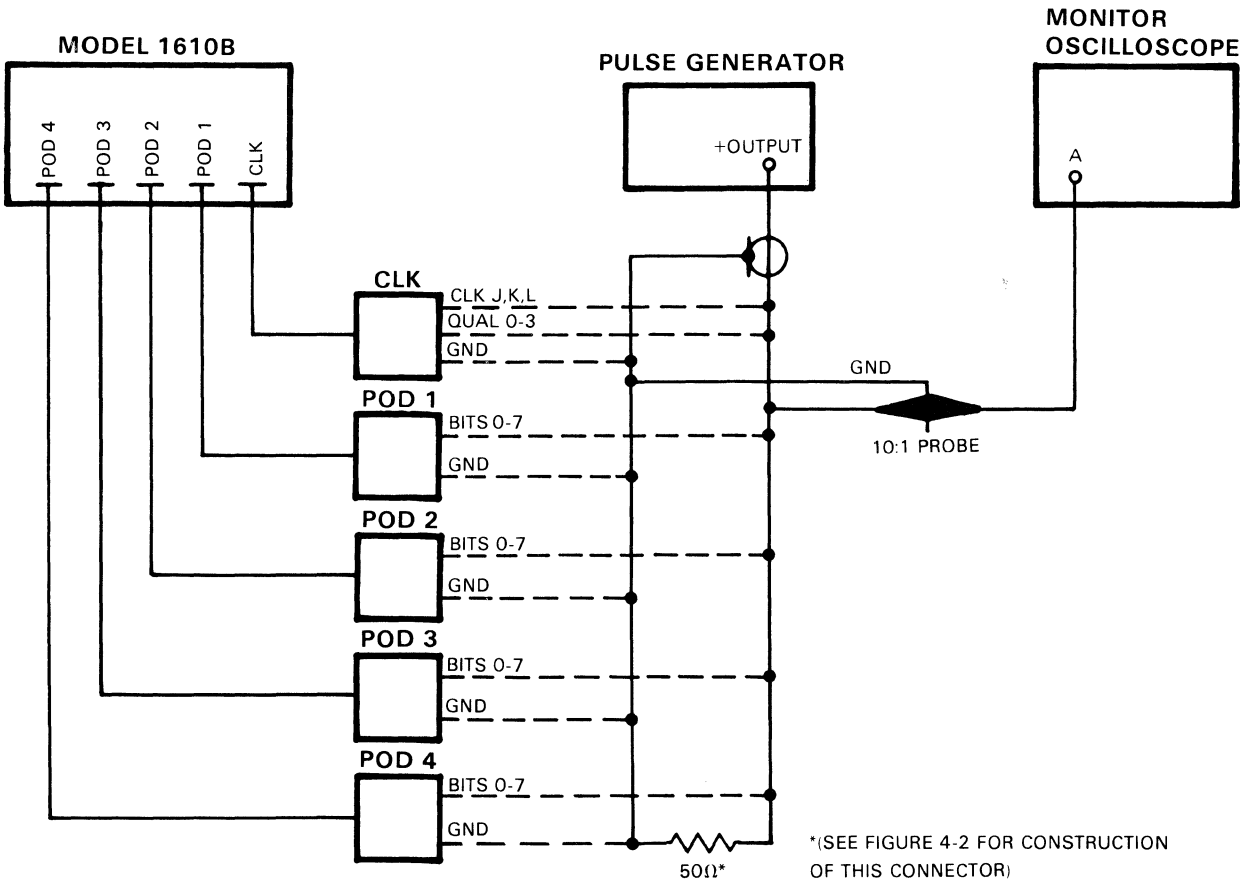


Figure 4-3. Input Threshold and Minimum Input Swing Test Setup

PERFORMANCE TESTS

PROCEDURE:

- a. Set 1610B LINE switch to off then on to initialize the 1610B.
- b. Set all POD THRESHOLD switches to TTL position.
- c. Connect Clock L input to pulse generator as shown in figure 4-3.

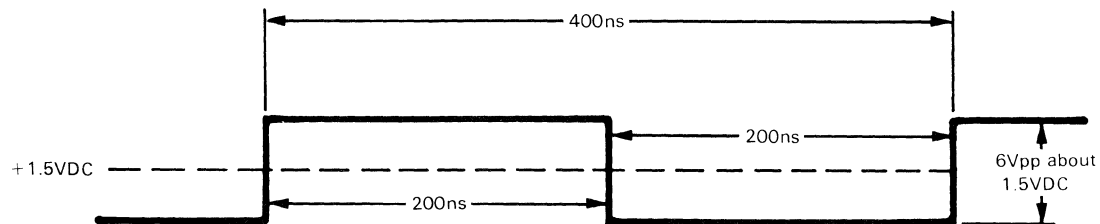


Figure 4-4. Input Threshold and Minimum Swing Test Waveform

- d. Adjust pulse generator output for waveform as shown in figure 4-4.
- e. Set Clock L slope to [+] and all other clock slopes to [OFF].
- f. Verify that "WARNING-SLOW CLOCK" message is not displayed in upper-left corner of screen.
- g. Repeat steps d through f for Clocks J and K, one at a time.
- h. Change Clock J slope to [+/-].
- i. Label all bits of Pod 1 "A"; all bits of Pod 2 "B"; all bits of Pod 3 "C"; and all bits of Pod 4 "D".
- j. Set numerical base to binary for labels A, B, C, and D.
- k. Connect bit 0 of Pod 1 to pulse generator as shown in figure 4-3.
- l. Press TRACE key and verify that the corresponding bit shows alternating 1's and 0's on screen.
- m. Disconnect bit 0 of Pod 1 from pulse generator.
- n. Repeat steps k through m for all remaining data bits, one at a time, for all remaining data pods.
- o. Connect Pod 1 bit 0 and qualifier bit 0 to pulse generator as shown in figure 4-3.
- p. Press FORMAT SPECIFICATION; set qualifier bit 0 to "0" for both plus and minus slope and all other qualifier bits to "X" (Don't Care).
- q. Press TRACE and verify that Pod 1, bit 0 contains only 0's.
- r. Set qualifier bit 0 to 1 for both + and - slope. Set all other qualifier bits to Don't Care.
- s. Press TRACE and verify that Pod 1, bit 0 contains only 1's.
- t. Repeat steps o through s for the remaining qualifier bits, one at a time.

PERFORMANCE TESTS

4-18. INPUT THRESHOLD RANGE TEST.

SPECIFICATION:

Input Threshold: Variable, ± 10 Vdc.

DESCRIPTION:

This procedure verifies that the variable threshold voltage adjustment has a ± 10 volt dc range for each pod.

EQUIPMENT:

- Pulse Generator HP 8013A
- Oscilloscope HP 1722B or HP 1743A

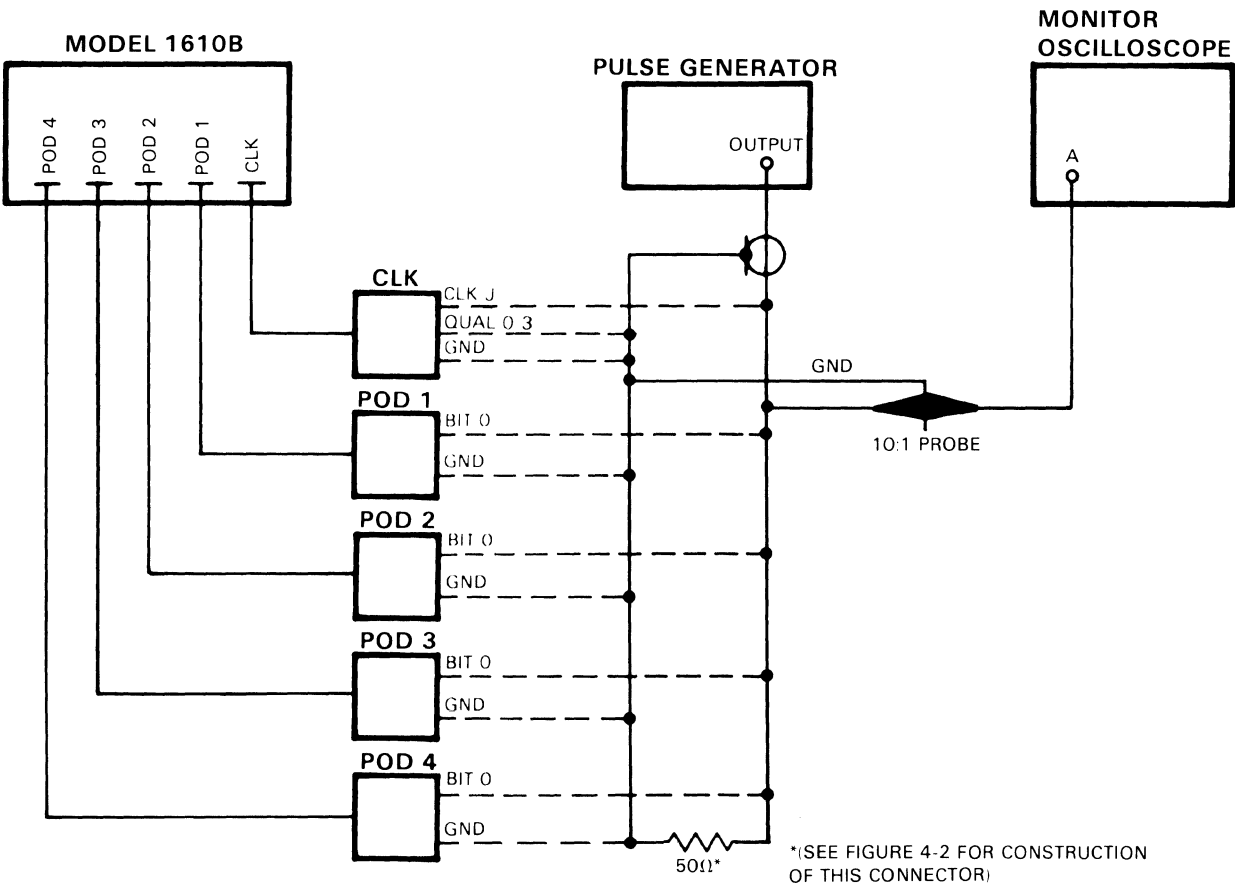


Figure 4-5. Input Threshold Range Test Setup

PROCEDURE:

- Press 1610B LINE switch to off then on to initialize the 1610B.
- Connect Clock J input to pulse generator as shown in figure 4-5.

PERFORMANCE TESTS

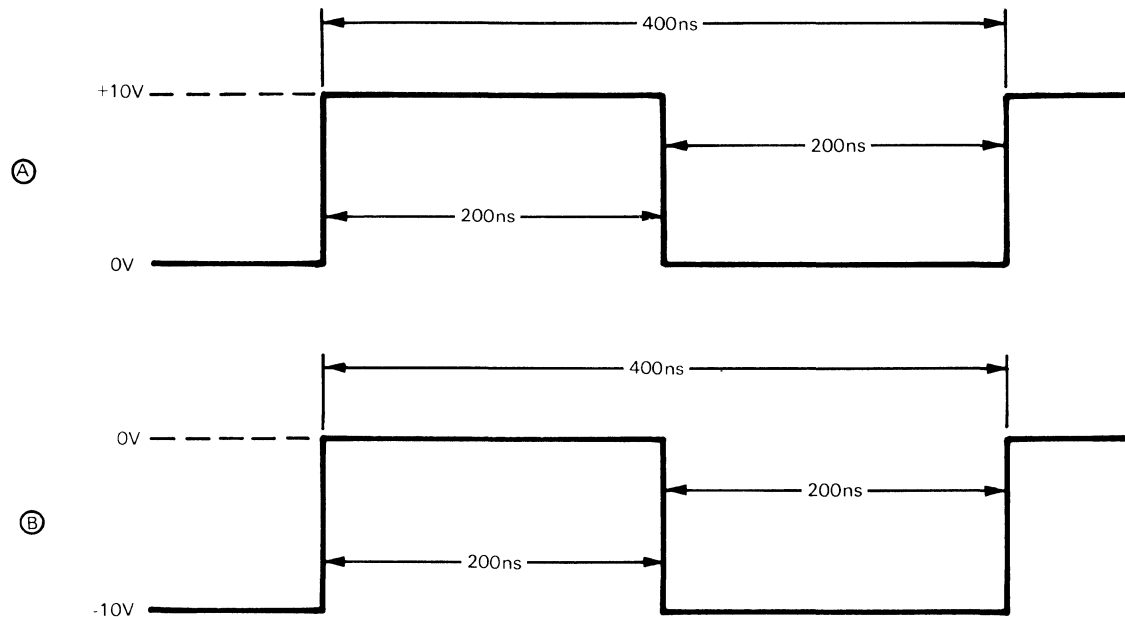


Figure 4-6. Input Threshold Range Test Waveform

- c. Adjust pulse generator for output waveform A as shown in figure 4-6.
 - d. Set Clock threshold switch to VAR position and turn clock threshold adjustment fully clockwise.
 - e. Verify that "WARNING-SLOW CLOCK" message is present at upper-left corner of screen.
 - f. Adjust pulse generator for output waveform B as shown in figure 4-6.
 - g. Turn clock threshold adjustment fully counterclockwise.
 - h. Verify "WARNING-SLOW CLOCK" message is present at upper left-hand corner of screen.
 - i. Set Clock POD THRESHOLD switch to TTL position.
 - j. Connect clock probe pod to rear-panel OUTPUT CLOCK pod connector.
 - k. Connect bit 0 of pods 1 thru 4 to pulse generator as shown in figure 4-5.
 - l. Set POD THRESHOLD switches for Pods 1 thru 4 to VAR position and turn threshold adjustments for Pods 1 thru 4 fully counterclockwise.
 - m. Hold TRACE key down until continuous trace is displayed at upper-right corner of screen.
 - n. Verify that data displayed is all F's.
 - o. Adjust pulse generator for output waveform A as shown in figure 4-6.
 - p. Turn threshold adjustments fully clockwise for pods 1 thru 4.
 - q. Verify that data displayed is all 0's.
-

PERFORMANCE TESTS

4-19. MINIMUM CLOCK WIDTH TEST.

SPECIFICATION:
Minimum Clock Width: 20 ns at threshold level.

DESCRIPTION:
This test verifies that the clock input circuitry functions properly with an input signal having a minimum clock width.

EQUIPMENT:
Pulse Generator HP 8013B
Oscilloscope HP 1722B or HP 1743A

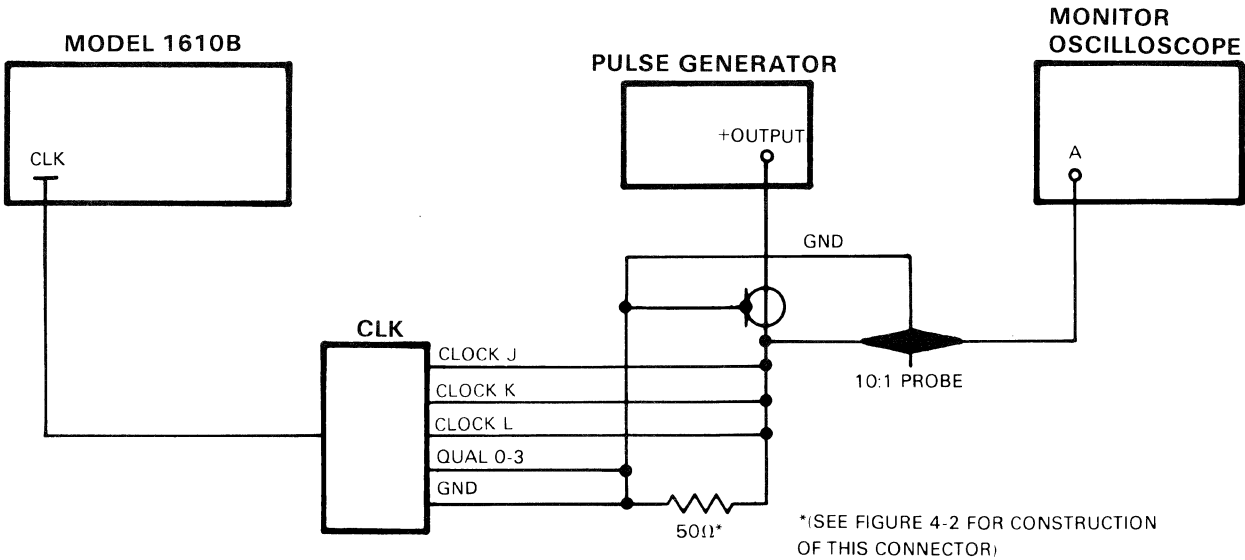


Figure 4-7. Minimum Clock Width Test Setup

- PROCEDURE:**
- a. Press 1610B LINE switch to off then on to initialize 1610B.
 - b. Set clock threshold switch to TTL position.
 - c. Connect Clock J, Clock K and Clock L inputs to pulse generator as shown in figure 4-7.

PERFORMANCE TESTS

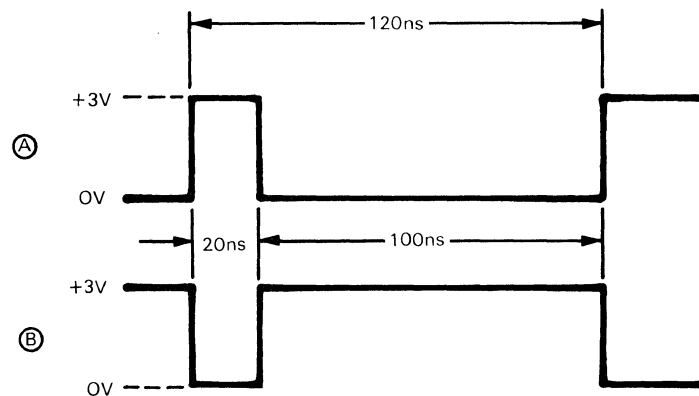


Figure 4-8. Minimum Clock Width Test Waveform

- d. Adjust pulse generator for output waveform A as shown in figure 4-8.
- e. Press TRACE key.
- f. Verify that "WARNING-SLOW CLOCK" message is not displayed in upper-left corner of screen and that time is either 0.1 or 0.2 microseconds.
- g. Press FORMAT SPECIFICATION key and set Clock J slope to [OFF] and Clock K to [+].
- h. Repeat steps e and f.
- i. Press FORMAT SPECIFICATION key; set Clock K slope to [OFF] and Clock L slope to [+].
- j. Repeat steps e and f.
- k. Press FORMAT SPECIFICATION key then press DEFAULT.
- l. Adjust pulse generator for waveform B as shown in figure 4-8.
- m. Repeat steps e thru j.

PERFORMANCE TESTS

4-20. DATA SETUP AND HOLD TIME TEST.

SPECIFICATION:
Data Setup Time: 20 ns max.
Data Hold Time: 0 ns.

DESCRIPTION:
Since the data inputs are sampled with selected transition of the clock, they must remain stable at the time of the clock to ensure that the desired input state is sampled. Data setup and hold time specifications define the time period that data inputs must remain stable. Data setup time is the time prior to the clock that data inputs must begin to be stable; data hold time is the time after the clock when data inputs are no longer required to remain stable. This test is to verify that the correct state is sampled when data inputs with minimum set up and hold time requirements are presented to the 1610B.

EQUIPMENT:
Pulse Generators (2) HP 8013B
Oscilloscope HP 1722B or HP 1743A

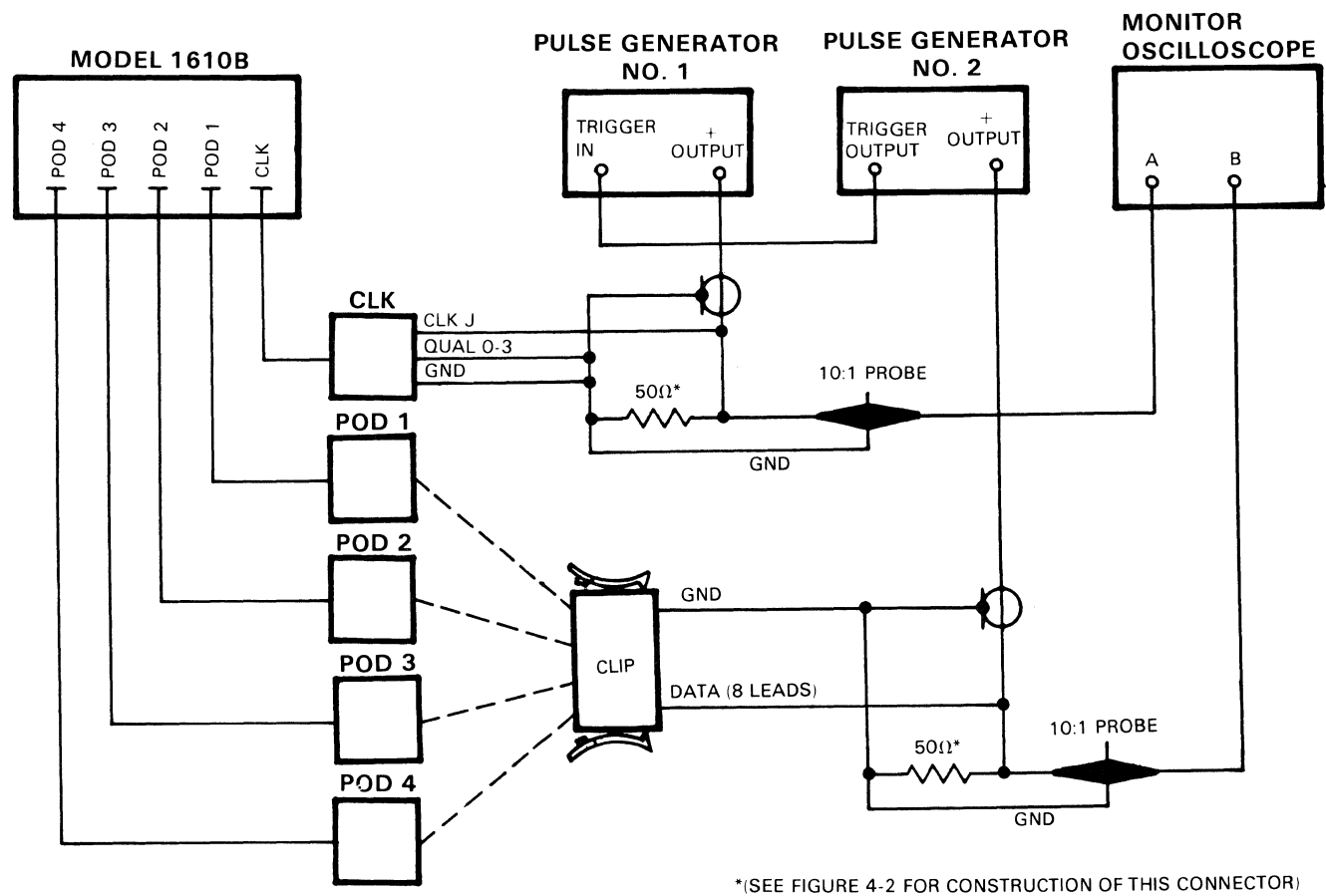


Figure 4-9. Data Setup and Hold Time Test Setup

PERFORMANCE TESTS

PROCEDURE:

- a. Set 1610B LINE switch to off then on to initialize the 1610B.
- b. Set front-panel POD THRESHOLD switches to TTL positions.
- c. Move cursor to label field and label pod 4 all "D's", pod 3 all "C's", pod 2 all "B's" and pod 1 all "A's".
- d. Connect clock probe and pod 1 data probe as shown in figure 4-9.
- e. Adjust pulse generators 1 and 2 for output waveforms A and B respectively as shown in figure 4-10.

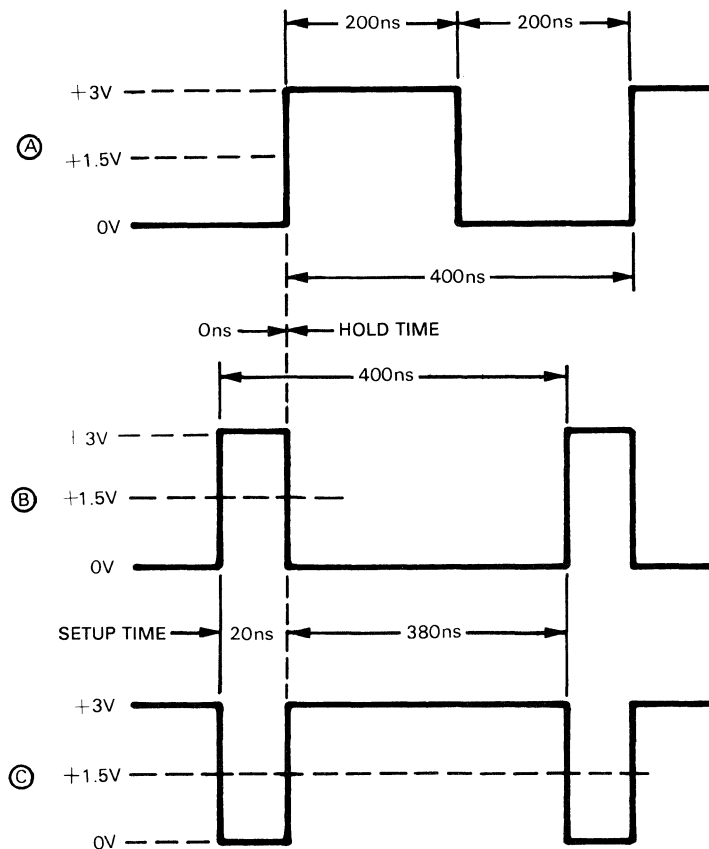


Figure 4-10. Data Setup and Hold Time Test Waveform

- f. Press TRACE key and verify that data for the corresponding pod being tested is FF for all lines shown on screen.
- g. Connect all remaining pods to clip connected to pulse generator number 2, one at a time and repeat step f for each pod.
- h. Adjust pulse generator number 2 for output waveform C as shown in figure 4-10.
- i. Press TRACE key and verify that data for the corresponding pod being tested is 00 for all lines shown on screen.
- j. Connect remaining pods to clip connected to pulse generator number 2 (one at a time) and repeat step i for each pod.

PERFORMANCE TESTS

4-21. QUALIFIER SETUP AND HOLD TIME TEST.

SPECIFICATION:

Qualifier Setup Time: 20 ns max.

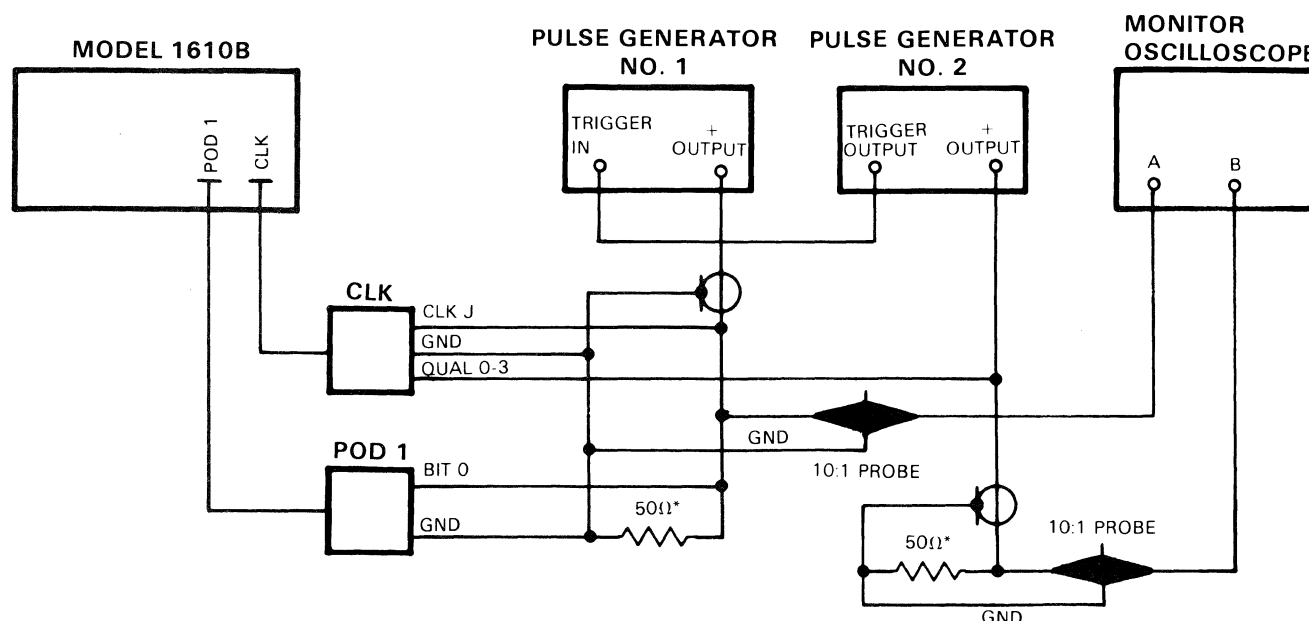
Qualifier Hold Time: 0 ns

DESCRIPTION:

Since qualifier inputs are sampled with selected transition of the clock, they must remain stable at the time of the clock to ensure that the desired input state is sampled. Qualifier setup and hold time specifications define the time period that qualifier inputs must remain stable. Qualifier setup time is the time prior to the clock that qualifier inputs must begin to be stable; qualifier hold time is the time after the clock when qualifier inputs are no longer required to remain stable. This test is to verify that the correct state is sampled when qualifier inputs with minimum setup and hold time requirements are presented to the 1610B.

EQUIPMENT:

Pulse Generators (2) HP 8013B
Oscilloscope HP 1722B or HP 1743A



*(SEE FIGURE 4-2 FOR CONSTRUCTION OF THIS CONNECTOR)

Figure 4-11. Qualifier Setup and Hold Time Test Setup

PROCEDURE:

- Set LINE switch to off then on to initialize the 1610B.
- Set front-panel POD THRESHOLD switches to TTL positions.
- Connect clock probe and pod 1 data probe to pulse generators as shown in figure 4-11.
- Adjust pulse generators 1 and 2 for output waveforms A and B respectively as shown in figure 4-12.

PERFORMANCE TESTS

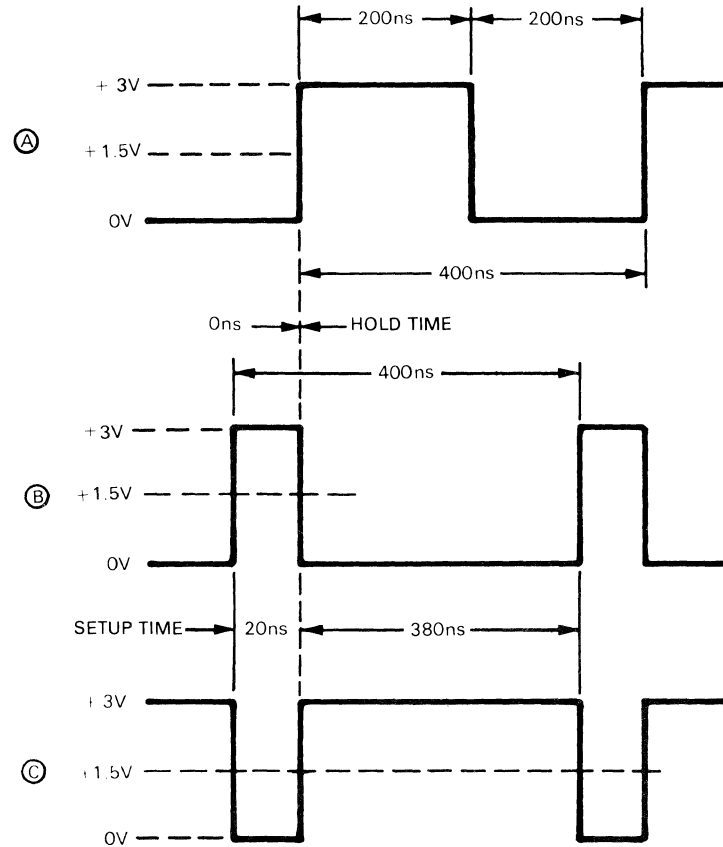


Figure 4-12. Qualifier Setup and Hold Time Test Waveform

- e. Change Clock J slope to [+/-].
- f. Set qualifier bits 0 thru 3 for both plus and minus slope to 1.
- g. Move cursor to label field, and label all bits of all pods "X" (Don't Care) except for bit 0 of pod 1.
- h. Press TRACE key and verify that the data is 0 for all lines on screen.
- i. Change pulse generator number 2 for output waveform C as shown in figure 4-12.
- j. Set qualifier bits 0 thru 3 for both plus and minus slope to 0.
- k. Press TRACE key and verify that data is equal to 0 for all lines shown on screen.

PERFORMANCE TESTS

4-22. TRIGGER AND MEASUREMENT ENABLE OUTPUT TEST.

SPECIFICATION.

TRIGGER OUTPUT (Rear Panel):

The 50 ns $\pm$ 10 ns positive TTL trigger pulse is generated each time the trace position is recognized. If the trace position includes a word sequence, the pulse occurs when the last word is found. The trigger output pulse will continue after a trace has been initialized unless the STOP key or the FORMAT SPECIFICATION key is pressed. If either of these keys is pressed, the trigger output will be disabled (low) until the TRACE key is pressed. Whenever the TRACE key is pressed, the 1610B initializes the data acquisition circuitry before starting the trace. During this time, the trigger output is disabled (low). If continuous trace or compared trace mode is selected, the trigger output will be disabled during the reinitialization period between traces.

MEASUREMENT ENABLE OUTPUTS (Rear Panel):

The positive TTL level measurement enable output (+) goes high and remains high when the 1610B is looking for trace position. It goes low when a trace position is recognized or if the STOP key is pressed. In continuous or compared trace modes, the transitions repeat each time the 1610B makes a new measurement. Measurement enable output (-) is the complement of measurement enable output (+).

DESCRIPTION:

This test verifies that the trigger output and measurement enable outputs are operating correctly and output the correct voltage levels into a 50-ohm load.

EQUIPMENT:

Oscilloscope HP 1722B or HP 1743A



Figure 4-13. Trigger Output Test Setup

PROCEDURE:

- Set 1610B LINE switch to off then on to initialize instrument.
- Connect clock probe into rear-panel CLOCK OUTPUT connector.
- Connect oscilloscope to rear-panel TRIGGER OUTPUT connector as shown in figure 4-13.
- Press TRACE key and verify the presence of a positive pulse with a high level of greater than or equal to +2.4 volts and a low level of less than or equal to +0.5 volts. Pulse width at the 1.5 volt level should be 50 ns $\pm$ 10 ns (see figure 4-14).

PERFORMANCE TESTS

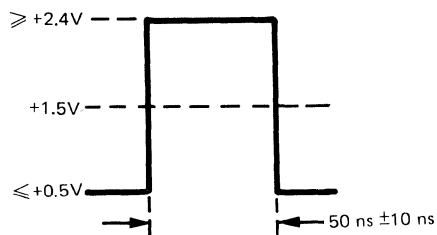


Figure 4-14. Trigger Output Pulse

- e. Disconnect clock probe from rear-panel CLOCK OUTPUT POD connector.
- f. Connect oscilloscope to 1610B MEAS ENABLE OUTPUT (+) as shown in figure 4-15.

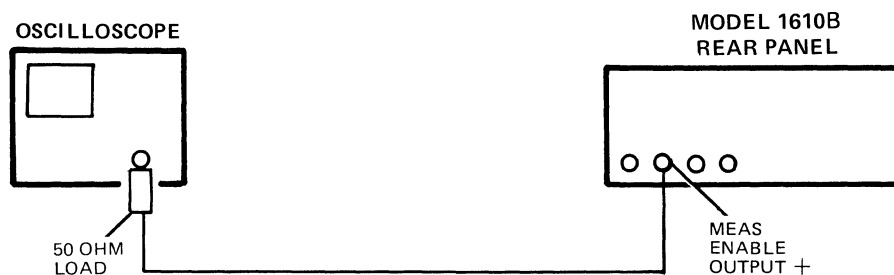


Figure 4-15. Measurement Enable Output Test Setup

- g. Press TRACE key.
- h. Verify dc level of greater than or equal to 2.4 volts on MEAS ENABLE OUTPUT (+).
- i. Connect oscilloscope to MEAS ENABLE OUTPUT (-).
- j. Verify dc level of less than or equal to 0.5 volts on MEAS ENABLE OUTPUT (-).
- k. Press STOP key.
- l. Verify dc level of greater than or equal to 2.4 volts on MEAS ENABLE OUTPUT (-).
- m. Connect oscilloscope to MEAS ENABLE OUTPUT (+).
- n. Verify dc level of less than or equal to 0.5 volts on MEAS ENABLE OUTUT (+).

PERFORMANCE TEST RECORD

HEWLETT-PACKARD MODEL 1610B LOGIC STATE ANALYZER SERIAL NO. _____				
			Tested By _____ Date _____	
Paragraph number	Test	Specification	Passed	Failed
4-7	Operation Verification			
4-9	ROM/RAM		_____	_____
4-10	Display		_____	_____
4-11	Keyboard		_____	_____
4-12	Trace		_____	_____
4-13	Interrupt		_____	_____
4-14	Printer		_____	_____
4-15	Performance Verification			
4-17	Input Threshold and Minimum Input Swing	TTL, ≈ 1.5 V Swing = 0.6 V p-p		
	Clock Pod		_____	_____
	Data Pod 1		_____	_____
	Data Pod 2		_____	_____
	Data Pod 3		_____	_____
	Data Pod 4		_____	_____
4-18	Input Threshold Range	VAR, ± 10 V		
	Clock Pod		_____	_____
	Data Pod 1		_____	_____
	Data Pod 2		_____	_____
	Data Pod 3		_____	_____
	Data Pod 4		_____	_____
4-19	Minimum Clock Width	Width = 20 ns at threshold level		
	Clock Width (+)		_____	_____
	Clock Width (-)		_____	_____
4-20	Data Setup and Hold Time	Setup time: 20ns Hold Time: 0 ns		
	Setup and Hold Time (1 Level)			
	Pod 1		_____	_____
	Pod 2		_____	_____
	Pod 3		_____	_____
	Pod 4		_____	_____

PERFORMANCE TEST RECORD (Cont'd)

Paragraph number	Test	Specification	Passed	Failed
4-20 (Cont'd)	Data Setup and Hold Time			
	Setup and Hold Time (0 Level)			
	Pod 1		_____	_____
	Pod 2		_____	_____
	Pod 3		_____	_____
4-21	Pod 4		_____	_____
	Qualifier Setup and Hold Time (0 thru 3)	Setup Time: 20 ns max. Hold Time: 0 ns.		
	Setup and Hold Time (1 Level)			
	Pod 1		_____	_____
	Pod 2		_____	_____
	Pod 3		_____	_____
	Pod 4		_____	_____
	Setup and Hold Time (0 Level)			
	Pod 1		_____	_____
	Pod 2		_____	_____
4-22	Pod 3		_____	_____
	Pod 4		_____	_____
	Trigger and Measurement Enable Output	See table 1-1		
	Trigger Output		_____	_____
	Meas Enable Output (+)		_____	_____
	Meas Enable Output (-)		_____	_____

SECTION V

ADJUSTMENTS

5-1. INTRODUCTION.

5-2. This section describes adjustments and checks required to return the instrument to peak operating capability after repairs have been made. Included in this section are adjustment procedures, waveforms, and adjustment location illustrations.

5-3. SAFETY REQUIREMENTS.

5-4. Although this instrument has been designed in accordance with international safety standards, general safety precautions must be observed during all phases of operation, service, and repair of the instrument. Failure to comply with precautions listed in the Safety Summary at the front of this manual or with specific warnings given throughout the manual could result in serious injury or death. Service adjustments should be performed only by qualified service personnel.

5-5. EQUIPMENT REQUIRED.

5-6. Test equipment required for adjustments is listed in the Recommended Test Equipment table in Section I. Test Equipment equivalent to that recommended may

be substituted if it meets the required characteristics. For best results, use recently calibrated test equipment.

5-7. ADJUSTMENTS.

5-8. Adjustment procedures in this section are not interrelated and may be performed separately. Refer to table 5-1 for a list of adjustable components and their functions.

5-9. After repair, the applicable adjustments should be made, but a complete readjustment of the instrument is unnecessary. For best results, allow the instrument to warm up for 15 minutes before making adjustments. Prior to any adjustments, however, the power supply should be checked for proper voltage levels.

5-10. ADJUSTMENT PROCEDURES.

WARNING

Adjustment procedures are performed with power supplied to the instrument and should be performed only by trained service personnel who are aware of the hazards involved (for example, fire and electrical shock).

Table 5-1. Adjustable Components

Reference Designator	Adjustment Name	Adjustment Paragraph	Service Sheet	Description
A18A2R48	+5 V	5-11	3B	+5 Volt Power Supply Adjustment
A18A2R49	-5.2 V	5-11	3B	-5.2 Volt Power Supply Adjustment
A18A2R47	+5 C	5-12	3B	+5 Volt Current Limit Adjustment
A18A2R50	-5.2 C	5-12	3B	-5.2 Volt Current Limit Adjustment
A10R48	SET LPOP	5-12	4A	Power Fail Adjustment
A9R72	INTENSITY LIMIT	5-13	8B	Sets maximum intensity limit for CRT display
A10R9	SET 15 kV	5-13	4A	Adjusts CRT post-accelerator voltage
A9R7	SET NORM	5-13	8A	Sets brightness level for the alphanumeric display and unintensified graph
A9R5	SET BRT	5-13	8A	Sets brightness level of intensifier used in graph mode
A9R42	X SIZE	5-13	8A	Adjusts horizontal size of display
A9R52	X POSN	5-13	8A	Adjusts horizontal position of display

Table 5-1. Adjustable Components (Cont'd)

Reference Designator	Adjustment Name	Adjustment Paragraph	Service Sheet	Description
A9R80	Y SIZE	5-13	8B	Adjusts vertical size of display
A9R27	Y POSN	5-13	8B	Adjusts vertical position of display
A9R71	FOCUS	5-13	8B	Adjusts focus of display
A6C47	ΔT ADJ	5-14	6C	Sets clock probe timing for 1610B self test
A3C14/17	TERM	5-15	11A	Adjusts the terminate strobes
A3C23	WRITE	5-15	11A	Adjusts the memory write strobe
A3C26	ADD	5-15	11A	Adjusts the memory address strobe
A3C8	READ	5-15	11A	Adjusts the memory read strobe
A3C28	COUNT	5-15	11A	Adjusts the count state strobe

ADJUSTMENTS

5-11. +5 V, -5.2 V POWER SUPPLY VOLTAGE ADJUSTMENT.

REFERENCE:

Service Sheet 3B and figure 5-1.

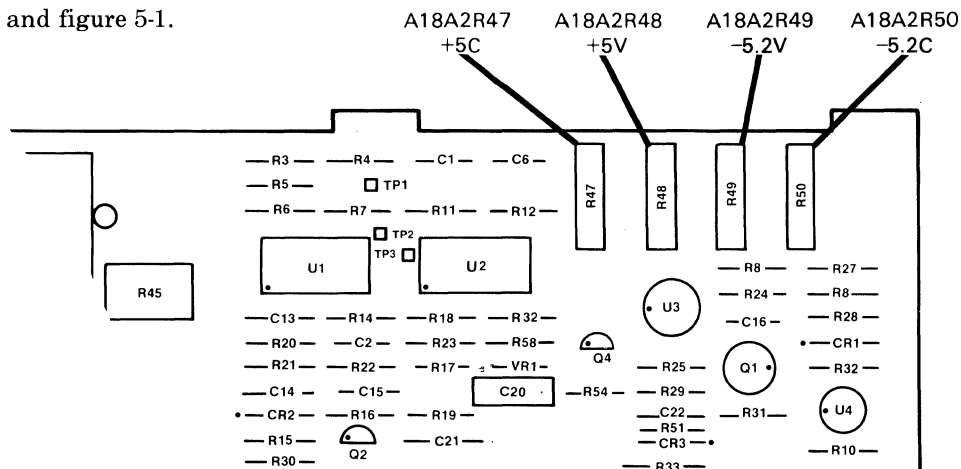


Figure 5-1. +5 V, -5.2 V Voltage and Current Limit Adjustment Locations

DESCRIPTION:

This adjustment sets the +5 V power supply and -5.2 V power supply output voltage. This adjustment should be performed only after repair to the +5 V or -5.2 V power supply.

EQUIPMENT:

Digital MultimeterHP 3465A

PROCEDURE:

- Connect DMM between Gnd sense wire (90; white/black) of A11J4 and +5 V sense wire (92; white/red) of A11TB1.
- On power supply A18, adjust A18A2R48 until DMM indicates $5.0 \text{ V} \pm 0.1 \text{ V}$.
- Connect DMM between Gnd Sense wire (90; white/black) of A11J4 and -5.2 V Sense wire (97; white/violet) of A11TB1.
- On power supply A18, adjust A18A2R49 until DMM indicates $-5.2 \text{ V} \pm 0.1 \text{ V}$.

ADJUSTMENTS

5-12. +5 V, -5.2 V CURRENT LIMIT ADJUSTMENT.

REFERENCE:

Figure 5-1 and Service Sheet 3B.

DESCRIPTION:

This procedure sets the +5 V and -5.2 V power supply current limit adjustments. It should be performed only after repair to the +5 V or -5.2 V current limiting circuits.

EQUIPMENT:

Digital MultimeterHP 3465A

NOTE

The +5 V and -5.2 V Current Limit Adjustment Procedure requires the use of a test load. This test load may be fabricated as shown in figure 5-2.

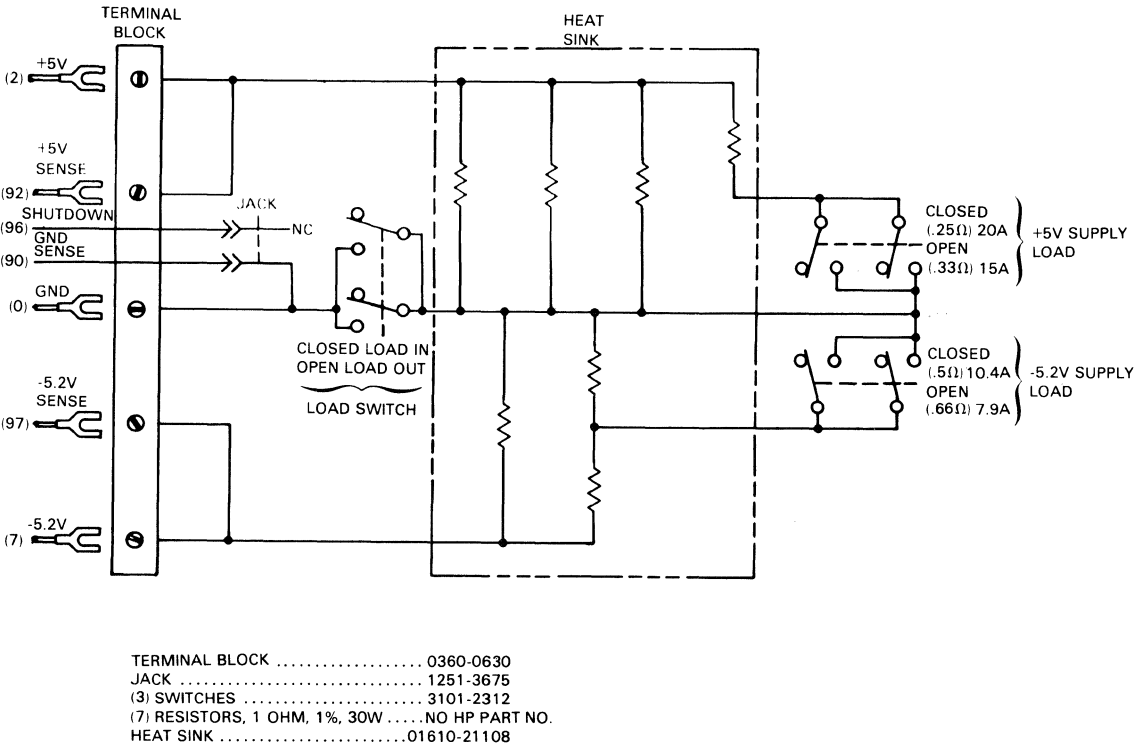


Figure 5-2. Power Supply Test Load

ADJUSTMENTS

PROCEDURE:

- a. Set 1610B LINE switch to off position.
- b. Disconnect A18W3 from A11J4 and A11TB1 and connect it to test load as shown in figure 5-2.
- c. Set load switch to open position (load out).
- d. Connect DMM to Ground Sense (90; white/black) and +5 V Sense (92; white/red).
- e. Set 1610B LINE switch to on position.
- f. Verify that DMM indicates +5 V ± 0.1 V. If voltage is not correct, refer to +5 V, -5.2 V Power Supply Voltage Adjustment (paragraph 5-11).
- g. Connect DMM to Ground Sense (90; white/black) and -5.2 V Sense (97; white/violet).
- h. Verify that DMM indicates -5.2 V ± 0.1 V. If voltage is not correct, refer to +5 V, -5.2 V Power Supply Adjustment (paragraph 5-11).
- i. Set load switch to closed (load in) position, and set +5 V load switch to 20A position.
- j. Connect DMM to Ground Sense (90; white/black) and +5 V Sense (92; white/red).
- k. Set +5 V Current Limit Adjustment A18A2R47 for a DMM indication of +4.5 V ± 0.1 V.
- l. Set +5 V test load switch to 15A position, and verify that DMM indicates +5 V ± 0.1 V.
- m. Connect DMM to -5.2 V Sense (97; white violet) and Ground Sense (90; white/black).
- n. Set +5.2 V load switch to 10.4A position.
- o. Set -5.2 V Current Limit Adjustment A18A2R50 for a DMM indication of -4.7 V ± 0.1 V.
- p. Set -5.2 V load switch to 7.9A position and verify that DMM indicates -5.2 V ± 0.1 V.
- q. Set 1610B LINE switch to off position.
- r. Reconnect cable A18W3 to A11J4 and A11TB1.

ADJUSTMENTS

5-13. POWER FAIL ADJUSTMENT.

REFERENCE:

Figure 5-3 and Service Sheet 4A.

DESCRIPTION:

This adjustment sets the low-power detection circuit which causes the 1610B to reinitialize in the event of a low-power pulse. This adjustment should be performed only after repair to the power fail circuitry.

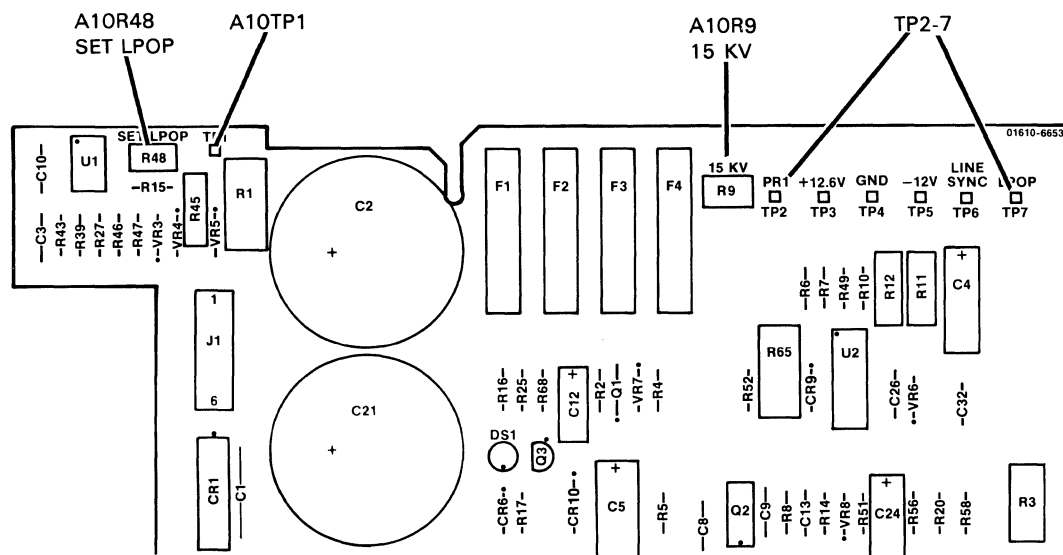


Figure 5-3. Power Fail and 15 kV Adjustment Locations

EQUIPMENT:

Digital MultimeterHP 3465A

PROCEDURE:

- a. Connect DMM between A10TP1 and A10TP4 (GND).
- b. Adjust A10R48 (SET LPOP) for $+4.75 \text{ V} \pm 0.5 \text{ V}$, -0 V .

ADJUSTMENTS

5-14. DISPLAY ADJUSTMENTS.

REFERENCE:

Figure 5-4 and Service Sheets 4A, 8A, and 8B.

DESCRIPTION:

These adjustments are to obtain optimum display. They should be performed after any repair to the display circuitry.

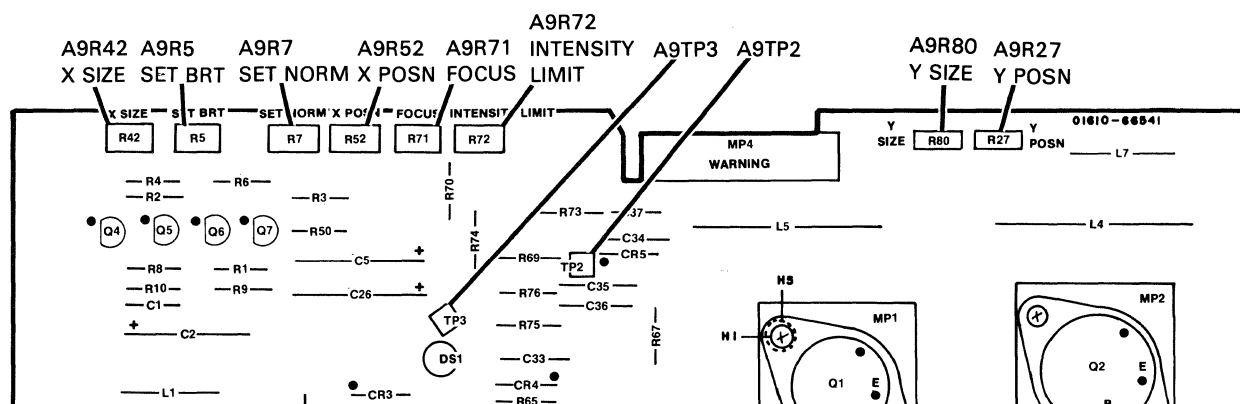


Figure 5-4. Display Adjustment Locations

EQUIPMENT:

Digital Multimeter HP 3465A
 Oscilloscope HP 1722B or 1743A

PROCEDURE:

- a. Adjust A9R72 (INTENSITY LIMIT) fully ccw (see Service Sheet 8B).
- b. Connect DMM between A9TP2 and chassis ground.
- c. Adjust A10R9 (SET 15 kV) for 510 V $\pm$ 10 V (see figure 5-3 and Service Sheet 4A).

ADJUSTMENTS

- d. Connect oscilloscope to A9TP3.
- e. Press START button on 1610B rear panel.
- f. Adjust oscilloscope for waveform as shown in figure 5-5.

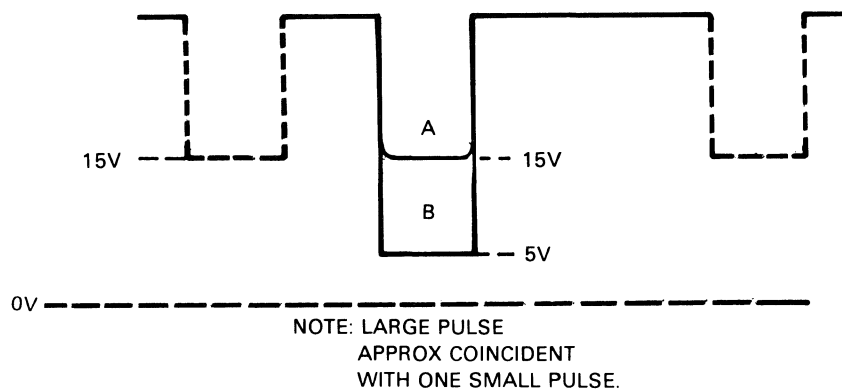


Figure 5-5. Display Adjust Waveform

- g. Adjust A9R7 (SET NORM) for amplitude A equal to +15 V $\pm$ 0.5 V (see Service Sheet 8A).
- h. Adjust A9R5 (SET BRT) for amplitude B equal to +5 V $\pm$ 0.5 V.
- i. Repeat steps g and h.
- j. Adjust A9R72 (INTENSITY LIMIT) cw until retrace lines are visible (preliminary adjustment).
- k. Adjust A9R72 (X SIZE), A9R52 (X POSN), A9R80 (Y SIZE), and A9R27 (Y POSN) until raster fills entire viewing area (see Service Sheets 8A and 8B).
- l. Adjust A9R72 (INTENSITY LIMIT) until retrace lines are no longer visible.
- m. Adjust A9R71 for optimum sharpness.

ADJUSTMENTS

5-15. STROBE ADJUSTMENTS.

REFERENCE:

Figure 5-6 and Service Sheet 11A.

DESCRIPTION:

These adjustments set up the timing relationships for the internal clocks used in the 1610B. The adjustments should be made if the Trace Test fails during Performance Verification.

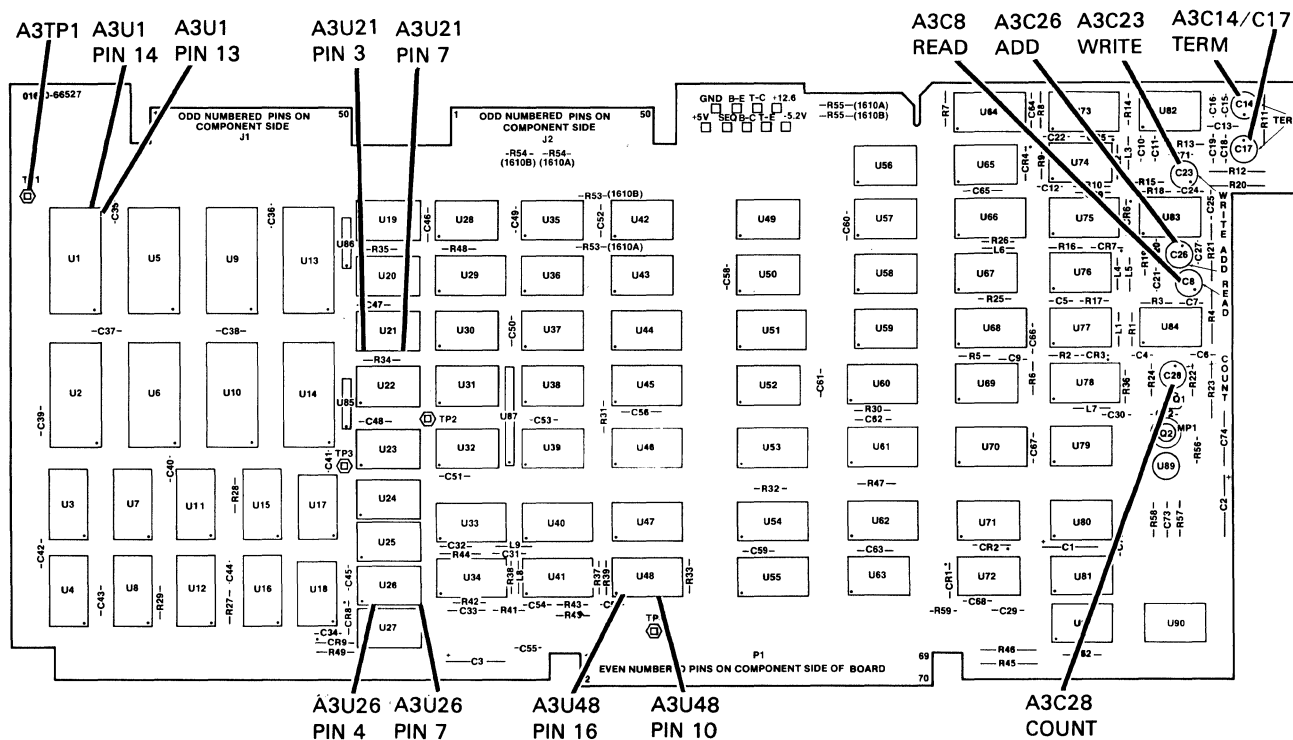


Figure 5-6. Strobe Adjustment Locations

ADJUSTMENTS

EQUIPMENT:

Oscilloscope HP 1722B or 1743A

PROCEDURE:**NOTE**

Strobe adjustments are critical. Make certain that oscilloscope probes are grounded properly. Adjustments should not be attempted without an oscilloscope that meets critical specifications listed in the recommended test equipment table in Section I.

- a. Remove top and right side covers and place assembly A3 on the extender board supplied with the instrument.
- b. Connect assemblies A1, A2, and A3 using the two high-speed cables provided (HP Part No. 01610-61623 and 01610-61624).
- c. Plug clock probe and data probe No. 1 into 1610B rear-panel probe sockets.
- d. Press START button on rear panel.
- e. Press FIELD SELECT key repeatedly until Keyboard Test is selected.

NOTE

If the 1610B is turned off to make any of the following connections, repeat steps d and e before making any adjustments.

- f. Connect channel A of oscilloscope to test point A1TP1 located near center of assembly A1 (see figure 5-7).

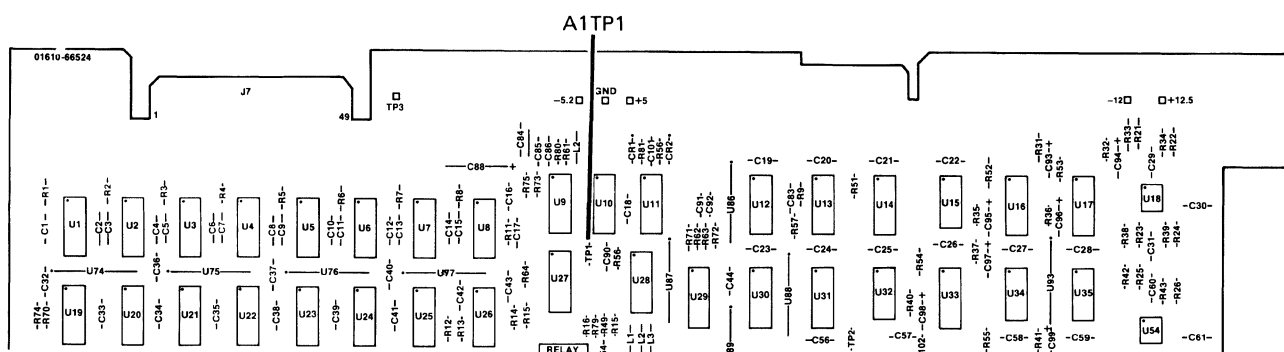


Figure 5-7. A1 Test Point Location

- g. Connect channel B of oscilloscope to A3TP1 or A3U1, pin 13. Use A3U1, pin 14 for ground if A3U1, pin 13 is used.
- h. Adjust A3C14 or A3C17 (TERM) for $97.5 \text{ ns} \pm 0.5 \text{ ns}$ between rising edge of channel A waveform (A1TP1) and rising edge of channel B waveform (A3TP1). See figure 5-8.

NOTE

Only one of the two capacitors (A3C14 or A3C17) will affect the time interval in step h. The other capacitor should be adjusted to obtain the correct time interval in step j.

ADJUSTMENTS

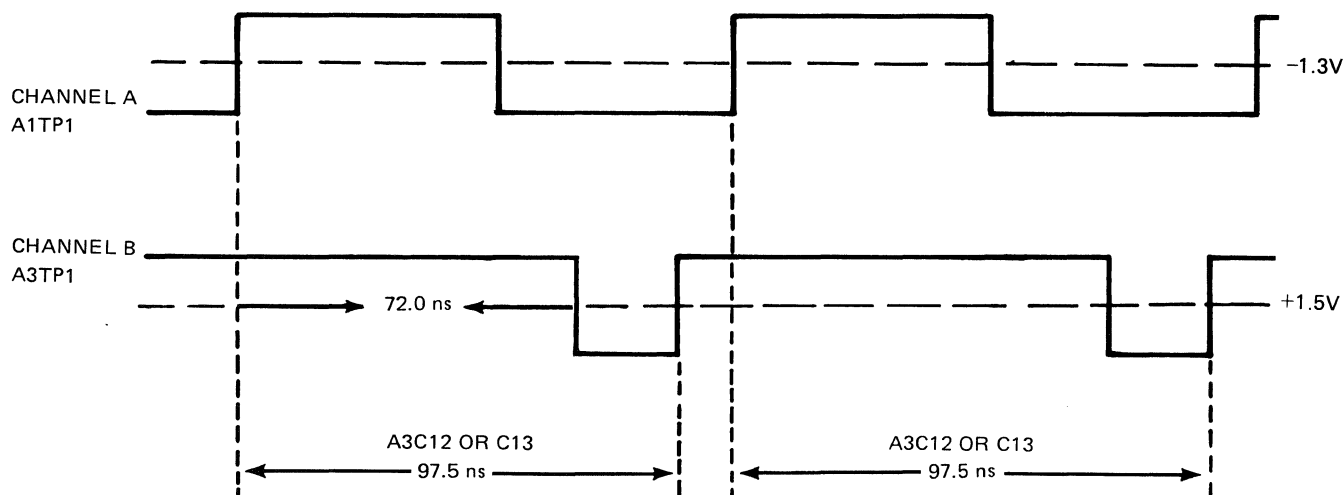


Figure 5-8. Term and Write Adjust Waveform

- i. Adjust oscilloscope to view next cycle of strobe present at A1TP1.
- j. Adjust A3C14 or A3C17 (TERM) for 97.5 ns between rising edge of channel A waveform (A1TP1) and rising edge of channel B waveform (A3TP1).
- k. Adjust A3C23 (WRITE) for 72.0 ns ± 0.5 ns between rising edge of channel A (A1TP1) and falling edge of channel B (A3TP1).

NOTE

A3 Board Assemblies earlier than Part No. 01610-66527, REV C, do not have test points A3TP2, TP3, or TP4; use IC pin numbers given in steps below as test points.

- l. Connect oscilloscope channel B to A3TP3 (or A3U26, pin 4; use pin 7 for ground). See figure 5-9.
- m. Adjust A3C26 (ADD) for 61 ns ± 0.5 ns between rising edge of channel A (A1TP1) and falling edge of channel B (A3TP3 or A3U26, pin 4; use pin 7 for ground).

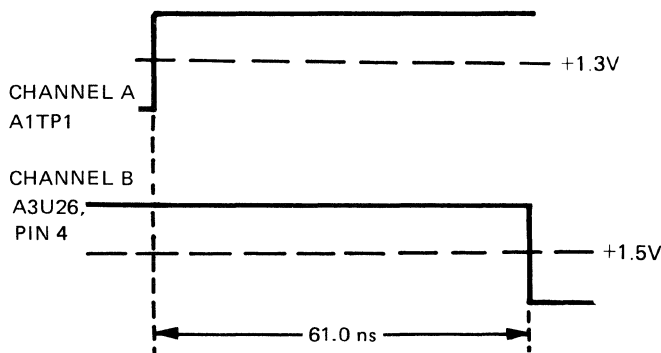


Figure 5-9. Add Adjust Waveform

ADJUSTMENTS

- n. Connect oscilloscope channel B to A3TP2 (or A3U21, pin 3; use pin 7 for ground).
- o. Adjust A3C8 (READ) for 62.5 ns between rising edge of channel A (A1TP1) and rising edge of channel B (A3TP2 or A3U21, pin 3). See figure 5-10.

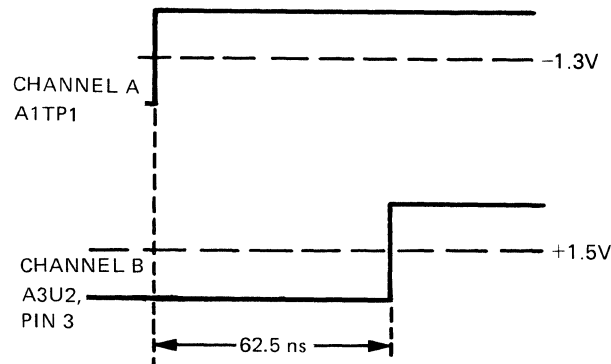


Figure 5-10. Read Adjust Waveform

- p. Connect oscilloscope channel B to A3TP4 (or A3U48, pin 10; use pin 16 for ground).
- q. Adjust A3C28 (COUNT) for 28 ns ± 0.5 ns between rising edge of channel A, A1TP1, and falling edge of channel B (A3TP4 or A3U48, pin 10). See figure 5-11.

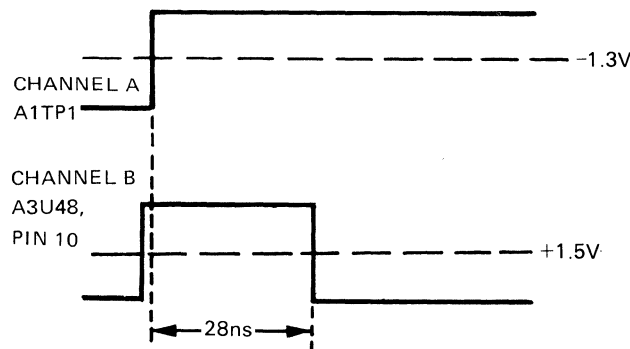


Figure 5-11. Count Adjust Waveform

SECTION VI

REPLACEABLE PARTS

6-1. INTRODUCTION.

6-2. This section contains information for ordering parts. Table 6-1 lists abbreviations used in the parts list and throughout the manual. Table 6-2 lists all replaceable parts in reference designator order. Table 6-3 contains the names and addresses that correspond to the manufacturers' code numbers.

6-3. ABBREVIATIONS.

6-4. Table 6-1 lists abbreviations used in the parts list, the schematics and throughout the manual. In some cases, two forms of the abbreviation are used, one all in capital letters, and one partial or no capitals. This occurs because the abbreviations in the parts list are always all capitals. However, in the schematics and other parts of the manual, other abbreviation forms are used with both lowercase and uppercase letters.

6-5. REPLACEABLE PARTS LIST.

6-6. Table 6-2 is the list of replaceable parts and is organized as follows:

- a. Electrical assemblies and their components in alphanumerical order by reference designation.
- b. Chassis-mounted parts in alphanumerical order by reference designation.
- c. Miscellaneous parts.

The information given for each part consists of the following:

- a. The Hewlett-Packard part number and the check digit (for HP internal use).
- b. The total quantity (Qty) in the instrument.
- c. The description of the part.
- d. A typical manufacturer of the part in a five-digit code.

- e. The manufacturer's number for the part.

The total quantity for each part is given only once—at the first appearance of the part number in the list.

6-7. ORDERING INFORMATION.

6-8. To order a part listed in the replaceable parts table, quote the Hewlett-Packard part number and check digit, indicate the quantity required, and address the order to the nearest Hewlett-Packard Office.

6-9. To order a part that is not listed in the replaceable parts table, include the instrument model number, instrument serial number, the description and function of the part, and the number of parts required. Address the order to the nearest Hewlett-Packard Office.

6-10. DIRECT MAIL ORDER SYSTEM.

6-11. Within the USA, Hewlett-Packard can supply parts through a direct mail order system. Advantages of using the system are as follows:

- a. Direct ordering and shipment from the HP Parts Center in Mountain View California.
- b. No maximum or minimum on any mail order (there is a minimum order amount for parts ordered through a local HP office when the orders require billing and invoicing).
- c. Prepaid transportation (there is a small handling charge for each order).
- d. No invoices—to provide these advantages, a check or money order must accompany each order.

6-12. Mail-order forms and specific ordering information are available through your local HP office. Addresses and phone numbers are located at the back of this manual.

Table 6-1. Reference Designators and Abbreviations

REFERENCE DESIGNATORS							
A	= assembly	F	= fuse	MP	= mechanical part	U	= integrated circuit
B	= motor	FL	= filter	P	= plug	V	= vacuum, tube, neon bulb, photocell, etc
BT	= battery	IC	= integrated circuit	Q	= transistor	VR	= voltage regulator
C	= capacitor	J	= jack	R	= resistor	W	= cable
CP	= coupler	K	= relay	RT	= thermistor	X	= socket
CR	= diode	L	= inductor	S	= switch	Y	= crystal
DL	= delay line	LS	= loud speaker	T	= transformer	Z	= tuned cavity network
DS	= device signaling (lamp)	M	= meter	TB	= terminal board		
E	= misc electronic part	MK	= microphone	TP	= test point		
ABBREVIATIONS							
A	= amperes	H	= henries	N/O	= normally open	RMO	= rack mount only
AFC	= automatic frequency control	HDW	= hardware	NOM	= nominal	RMS	= root-mean square
AMPL	= amplifier	HEX	= hexagonal	NPO	= negative positive zero (zero temperature coefficient)	RWV	= reverse working voltage
BFO	= beat frequency oscillator	HG	= mercury	NPN	= negative-positive-negative	S-B	= slow-blow
BE CU	= beryllium copper	HR	= hour(s)	NRFR	= not recommended for field replacement	SCR	= screw
BH	= binder head	HZ	= hertz	NSR	= not separately replaceable	SE	= selenium
BP	= bandpass	IF	= intermediate freq			SECT	= section(s)
BRS	= brass	IMPG	= impregnated			SEMICON	= semiconductor
BWO	= backward wave oscillator	INCD	= incandescent			SI	= silicon
CCW	= counter-clockwise	INCL	= include(s)	OBD	= order by description	SIL	= silver
CER	= ceramic	INS	= insulation(ed)	OH	= oval head	SL	= slide
CMO	= cabinet mount only	INT	= internal	OX	= oxide	SPG	= spring
COEF	= coefficient	K	= kilo=1000			SPL	= special
COM	= common			P	= peak	SST	= stainless steel
COMP	= composition	LH	= left hand	PC	= printed circuit	SR	= split ring
COMPL	= complete	LIN	= linear taper	PF	= picofarads= 10 ⁻¹² farads	STL	= steel
CONN	= connector	LK WASH	= lock washer	PH BRZ	= phosphor bronze	TA	= tantalum
CP	= cadmium plate	LOG	= logarithmic taper	PHL	= phillips	TD	= time delay
CRT	= cathode-ray tube	LPF	= low pass filter	PIV	= peak inverse voltage	TGL	= toggle
CW	= clockwise	M	= milli=10 ⁻³	PNP	= positive-negative-positive	THD	= thread
DEPC	= deposited carbon	MEG	= meg=10 ⁶	P/O	= part of	TI	= titanium
DR	= drive	MET FLM	= metal film	POLY	= polystyrene	TOL	= tolerance
ELECT	= electrolytic	MET OX	= metallic oxide	PORC	= porcelain	TRIM	= trimmer
ENCAP	= encapsulated	MFR	= manufacturer	POS	= position(s)	TWT	= traveling wave tube
EXT	= external	MHZ	= mega hertz	POT	= potentiometer	U	= micro=10 ⁻⁶
F	= farads	MINAT	= miniature	PP	= peak-to-peak	VAR	= variable
FH	= flat head	MOM	= momentary	PT	= point	VDCW	= dc working volts
FIL H	= fillister head	MOS	= metal oxide substrate	PWV	= peak working voltage	W/	= with
FXD	= fixed	MTG	= mounting	RECT	= rectifier	W	= watts
G	= giga (10 ⁹)	MY	= "mylar"	RF	= radio frequency	WIV	= working inverse voltage
GE	= germanium	N	= nano (10 ⁻⁹)	RH	= round head or right hand	WW	= wirewound
GL	= glass	N/C	= normally closed			W/O	= without
GRD	= grounded	NE	= neon				
		NI PL	= nickel plate				

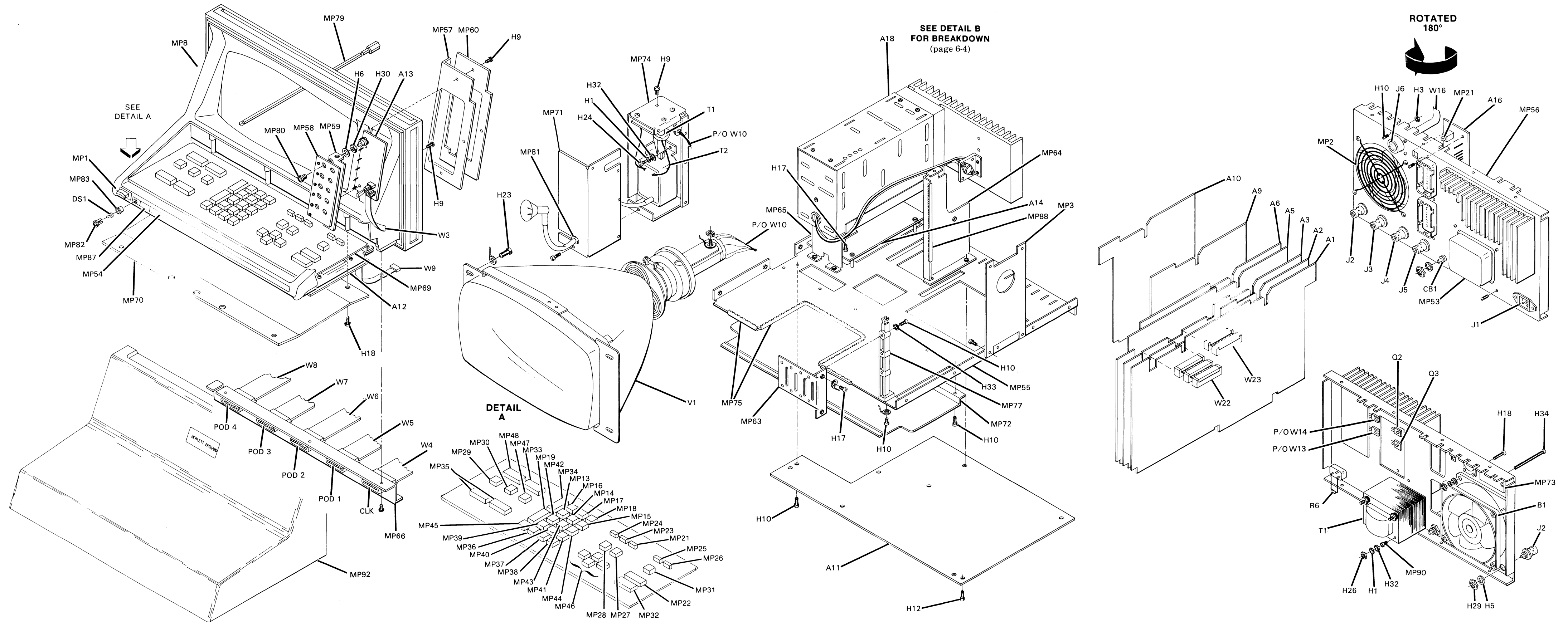


Figure 6-1.
Illustrated Parts Breakdown (Sheet 1 of 2)
6-3

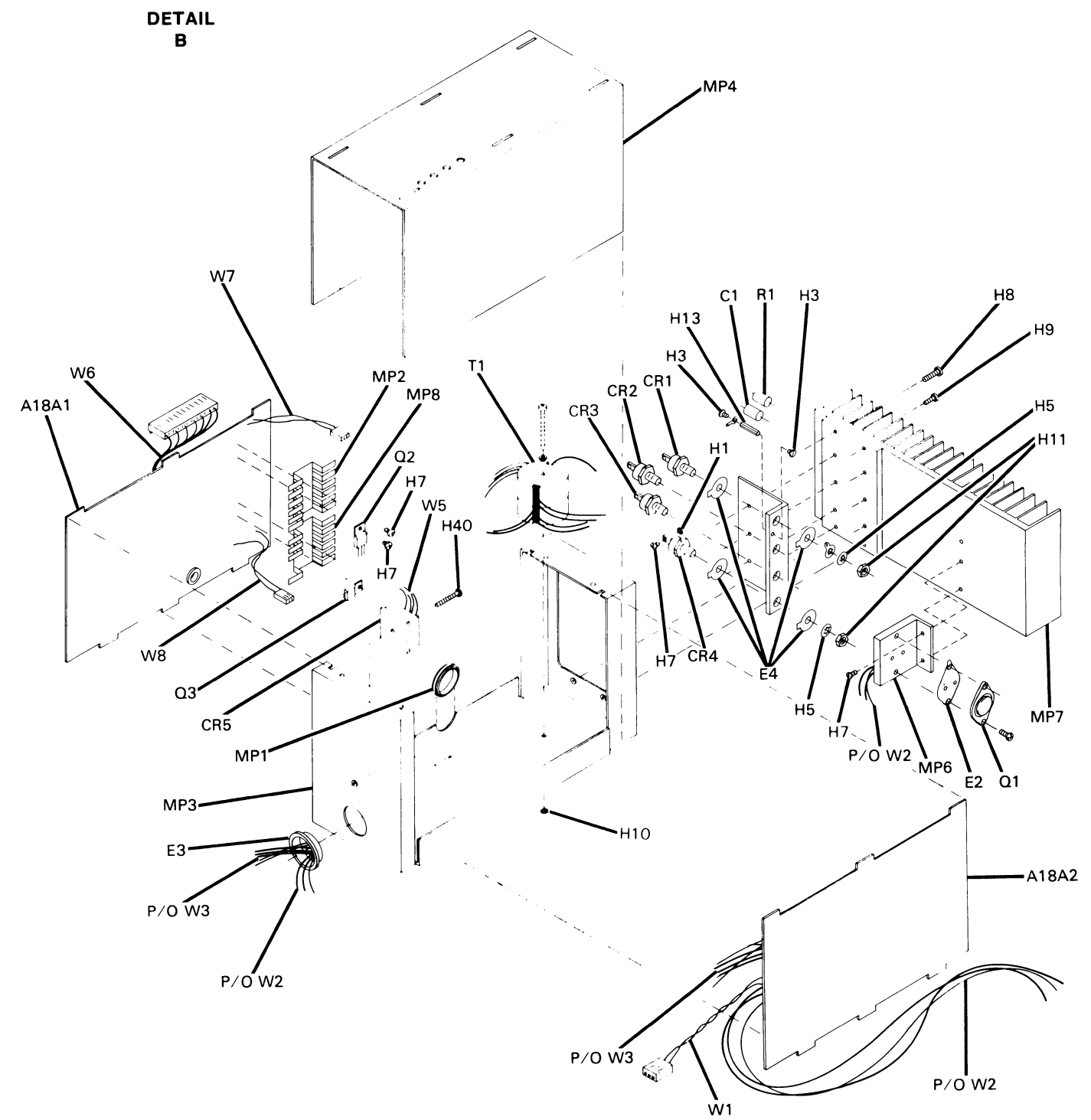
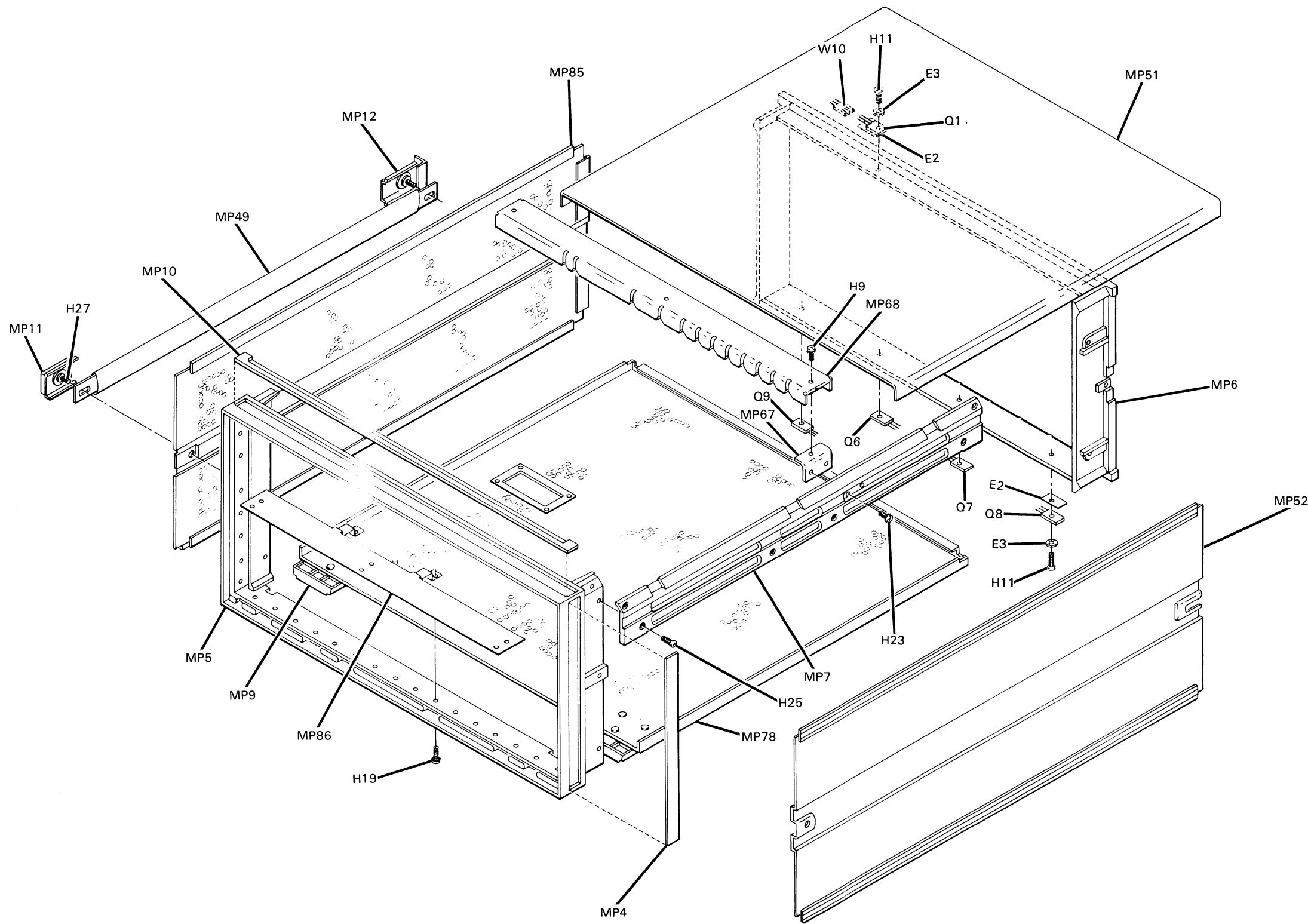


Figure 6-1. Illustrated Parts Breakdown (Sheet 2 of 2)

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
CHASSIS PARTS						
A1	01610-66524	7		STATE RECOG ASSY	28480	01610-66524
A2	01610-66526	9		INDEX BOARD ASSY	28480	01610-66526
A3	01610-66527	0		MEASUREMENT BOARD ASSY	28480	01610-66527
A5	01610-66505	4		DISPLAY/CONTROL ASSY	28480	01610-66505
A6	01610-66546	5		I/O MPU BOARD ASSY	28480	01610-66546
A9	01610-66545	8		DISPLAY/DRIVER ASSY	28480	01610-66545
A10	01610-66549	6		POWER SUPPLY BOARD ASSY	28480	01610-66549
A11	01610-66533	8		MOTHER BOARD ASSY	28480	01610-66533
A12	01610-66512	3		KEYBOARD ASSY	28480	01610-66512
A13	01610-66513	4		THRESHOLD ASSY	28480	01610-66513
A14	01610-66536	1		TAP CHANGER ASSY	28480	01610-66536
A15	01610-66515	6	1	HIGH VOLTAGE ASSY	28480	01610-66515
A16	01610-66525	8		PROBE/DRIVER ASSY	28480	01610-66525
A18	01610-60103	6		POWER SUPPLY ASSY	28480	01610-60103
B1	3160-0259	4		FAN-TBAX 120-CFM 115V 50/60-HZ 1.5=THK	28480	3160-0259
CB1	3105-0108	6	1	CIRCUIT BREAKER 1P .8A 250VAC CSA	28480	3105-0108
DB1	1990-0524	3	1	LED-VISIBLE LUM-INT=1MCD IF=20MA=MAX	28480	5082-4550
E2	0340-0511	0	1	INSULATOR-XSTR ALUMINUM HD=ANDZ	28480	0340-0511
E3	0340-0867	9	1	INSULATOR-PLG-BSHG NYLON	28480	0340-0867
F1	2110-0003	0		FUSE 3A 250V FAST-BLO 1.25X.25 UL	75915	312003
H1	2190-0017	4		WASHER=LK HLCL NO. 8 .168-IN-ID	28480	2190-0017
H2	3050-0066	8	1	WASHER=FL MTLC NO. 6 .147-IN-ID	28480	3050-0066
H3	2260-0009	3	8	NUT=HEX=H/LKWR 4-40=THD .094-IN=THK	00000	ORDER BY DESCRIPTION
H4	2190-0005	0	9	WASHER=LK EXT T NO. 4 .116-IN-ID	28480	2190-0005
H5	2190-0068	5	4	WASHER=LK INTL T 1/2 IN .505-IN-ID	28480	2190-0068
H6	2190-0084	5	5	WASHER=LK INTL T 1/4 IN .256-IN-ID	28480	2190-0084
H7	2190-0909	3		WASHER=LK INTL T NO. 6 .146-IN-ID	28480	2190-0909
H8	2190-0910	6	1	WASHER=LK INTL T NO. 4 .12-IN-ID	28480	2190-0910
H9	2200-0103	2		SCREW=MACH 4-40 .25-IN-LG PAN=HD=POZI	00000	ORDER BY DESCRIPTION
H10	2200-0105	4	25	SCREW=MACH 4-40 .312-IN-LG PAN=HD=POZI	00000	ORDER BY DESCRIPTION
H11	2200-0107	6		SCREW=MACH 4-40 .375-IN-LG PAN=HD=POZI	00000	ORDER BY DESCRIPTION
H12	2200-0111	2	16	SCREW=MACH 4-40 .5-IN-LG PAN=HD=POZI	00000	ORDER BY DESCRIPTION
H13	2200-0117	8	4	SCREW=MACH 4-40 .875-IN-LG PAN=HD=POZI	00000	ORDER BY DESCRIPTION
H14	2200-0123	6	4	SCREW=MACH 4-40 1.25-IN-LG PAN=HD=POZI	00000	ORDER BY DESCRIPTION
H15	2200-0143	0	1	SCREW=MACH 4-40 .375-IN-LG PAN=HD=POZI	00000	ORDER BY DESCRIPTION
H16	2340-0001	5	1	NUT=HEX=OBL-CHAM 4-40=THD .062-IN=THK	28480	2340-0001
H17	2360-0115	4	3	SCREW=MACH 6-32 .312-IN-LG PAN=HD=POZI	00000	ORDER BY DESCRIPTION
H18				NOT ASSIGNED		
H19	2360-0194	9	7	SCREW=MACH 6-32 .312-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
H20	2360-0197	2	7	SCREW=MACH 6-32 .375-IN-LG PAN=HD=POZI	00000	ORDER BY DESCRIPTION
H21	2420-0001	5	4	NUT=HEX=H/LKWR 6-32=THD .109-IN=THK	00000	ORDER BY DESCRIPTION
H22	2510-0065	2	1	SCREW=MACH 8-32 1.75-IN-LG PAN=HD=POZI	00000	ORDER BY DESCRIPTION
H23	2510-0045	8	23	SCREW=MACH 8-32 .375-IN-LG PAN=HD=POZI	00000	ORDER BY DESCRIPTION
H24	2510-0107	3	2	SCREW=MACH 8-32 .5-IN-LG PAN=HD=POZI	00000	ORDER BY DESCRIPTION
H25	2510-0192	6	24	SCREW=MACH 8-32 .25-IN-LG 100 DEG	28480	2510-0192
H26	3050-0023	7	2	WASHER=FL NM NO. 6 .144-IN-ID .25-IN=OD	28480	3050-0023
H27	2680-0172	1	4	SCREW=MACH 10-32 .375-IN-LG 100 DEG	28480	2680-0172
H29	2950-0054	1	2	NUT=HEX=OBL-CHAM 1/2-28=THD .125-IN=THK	00000	ORDER BY DESCRIPTION
H30	2950-0072	3	5	NUT=HEX=OBL-CHAM 1/4-32=THD .062-IN=THK	00000	ORDER BY DESCRIPTION
H31	2990-0001	1	4	NUT=HEX=OBL-CHAM 10-24=THD .125-IN=THK	00000	ORDER BY DESCRIPTION
H32	3050-0071	5	6	WASHER=FL MTLC NO. 8 .169-IN-ID	28480	3050-0071
H33	3050-0235	3	8	WASHER=FL MTLC NO. 4 .117-IN-ID	28480	3050-0235
H34	2510-0137	9	4	SCREW=MACH 8-32 2.75-IN-LG PAN=HD=POZI	00000	ORDER BY DESCRIPTION
H35	2200-0137	2	2	SCREW=MACH 4-40 .188-IN-LG PAN=HD=POZI	00000	ORDER BY DESCRIPTION
H36	2260-0001	5	2	NUT=HEX=OBL-CHAM 4-40=THD .094-IN=THK	28480	2260-0001
H38	2360-0117	6		SCREW=MACH 6-32 .375-IN-LG PAN=HD=POZI	00000	ORDER BY DESCRIPTION
H39	2360-0121	2		SCREW=MACH 6-32 .5-IN-LG PAN=HD=POZI	00000	ORDER BY DESCRIPTION
H40	2360-0125	6	1	SCREW=MACH 6-32 .75-IN-LG PAN=HD=POZI	00000	ORDER BY DESCRIPTION
H41	2360-0201	9	2	SCREW=MACH 6-32 .5-IN-LG PAN=HD=POZI	00000	ORDER BY DESCRIPTION
H42	2360-0203	1		SCREW=MACH 6-32 .625-IN-LG PAN=HD=POZI	00000	ORDER BY DESCRIPTION
H43	2190-0034	5	4	WASHER=LK HLCL NO. 10 .194-IN-ID	28480	2190-0034
H44	3050-0003	3	1	WASHER=FL NM NO. 6 .141-IN-ID .375-IN=OD	28480	3050-0003
H45	3050-0006	6	2	WASHER=SHLDR NO. 10 .2-IN-ID .5-IN=OD	28480	3050-0006

See introduction to this section for ordering information

*Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
J2	1250-1032	2	4	CONN RF BNC-BMD MTG	28480	1250-1032
J3	1250-1032	2		CONN RF BNC-BMD MTG	28480	1250-1032
J4	1250-1032	2		CONN RF BNC-BMD MTG	28480	1250-1032
J5	1250-1032	2		CONN RF BNC-BMD MTG	28480	1250-1032
L1	9100-3929	1	1	CRT - YOKE	28480	9100-3929
MP1	0370-2989	3	1	KEY CAP, OFF LINE	28480	0370-2989
MP2	3160-0092	3	1	FINGER GUARD, 194-TMK	28480	3160-0092
MP3	01610-04703	4	1	GUSSET, SIDE	28480	01610-04703
MP4	5001-0441	2	2	TRIM, SIDE, FRONT, FRAME	28480	5001-0441
MP5	5020-8807	0	1	FRAME, FRONT	28480	5020-8807
MP6	5020-8808	1	1	FRAME, REAR	28480	5020-8808
MP7	5020-8837	6	4	STRUT, CORNER	28480	5020-8837
MP8	5040-0566	4	1	SUPPORT, KEYBOARD	28480	5040-0566
MP9	5040-7201	8	4	FOOT (STANDARD)	28480	5040-7201
MP10	5040-7202	9	1	TRIM, TOP	28480	5040-7202
MP11	5040-7219	8	2	STRAP, HANDLE, CAP=FRONT	28480	5040-7219
MP12	5040-7220	1	2	STRAP, HANDLE, CAP=REAR	28480	5040-7220
MP13	5041-0040	1	1	KEY CAP, A	28480	5041-0040
MP14	5041-0041	2	1	KEY CAP, B	28480	5041-0041
MP15	5041-0042	3	1	KEY CAP, C	28480	5041-0042
MP16	5041-0043	4	1	KEY CAP, D	28480	5041-0043
MP17	5041-0044	5	1	KEY CAP, E	28480	5041-0044
MP18	5041-0045	6	1	KEY CAP, F	28480	5041-0045
MP19	5041-0071	8	1	KEY CAP, "DO NOT CARE"	28480	5041-0071
MP20	5041-0301	7	1	KEY CAP, BLANK	28480	5041-0301
MP21	5041-0375	5	1	KEY CAP, BLANK	28480	5041-0375
MP22	5041-0631	6	1	KEY CAP, TRACE	28480	5041-0631
MP23	5041-0655	4	1	KEY CAP, INSERT	28480	5041-0655
MP24	5041-0656	5	1	KEY CAP, DELETE	28480	5041-0656
MP25	5041-0657	6	1	KEY CAP, ARROW	28480	5041-0657
MP26	5041-0658	7	1	KEY CAP, DOUBLE ARROW	28480	5041-0658
MP27	5041-0659	8	1	KEY CAP, "INCR"	28480	5041-0659
MP28	5041-0660	1	1	KEY CAP, "DECODER"	28480	5041-0660
MP29	5041-0661	2	1	KEY CAP, "LIST"	28480	5041-0661
MP30	5041-0662	3	1	KEY CAP, "GRAPH"	28480	5041-0662
MP31	5041-0663	4	1	KEY CAP, "PRINT"	28480	5041-0663
MP32	5041-0664	5	1	KEY CAP, "STOP"	28480	5041-0664
MP33	5041-0665	6	1	KEY CAP, "TRACE SPE"	28480	5041-0665
MP34	5041-0666	7	1	KEY CAP, "FIELD SEL"	28480	5041-0666
MP35	5041-0667	8	2	KEY CAP, "ARROW"	28480	5041-0667
MP36	5041-0676	9	1	KEY CAP, "1"	28480	5041-0676
MP37	5041-0677	0	1	KEY CAP "2"	28480	5041-0677
MP38	5041-0678	1	1	KEY CAP "3"	28480	5041-0678
MP39	5041-0679	2	1	KEY CAP "4"	28480	5041-0679
MP40	5041-0680	5	1	KEY CAP "5"	28480	5041-0680
MP41	5041-0681	6	1	KEY CAP "6"	28480	5041-0681
MP42	5041-0682	7	1	KEY CAP "7"	28480	5041-0682
MP43	5041-0683	8	1	KEY CAP "8"	28480	5041-0683
MP44	5041-0684	9	1	KEY CAP "9"	28480	5041-0684
MP45	5041-0685	0	1	KEY CAP "0"	28480	5041-0685
MP46	5041-0686	1	4	KEY CAP "ARROW"	28480	5041-0686
MP47	5041-0734	0	1	KEY CAP "CMPR STOR"	28480	5041-0734
MP48	5041-0735	1	1	KEY CAP "FORMAT SPE"	28480	5041-0735
MP49	5060-9804	3	2	HANDLE STRAP	28480	5060-9804
MP50				NOT ASSIGNED		
MP51	5061-1937	9	1	COVER, TOP-STD-FM	28480	5061-1937
MP52	5061-1938	0	1	COVER, SIDE	28480	5061-1938
MP53	9100-0118	4	1	COVER, TRANSFORMER	28480	9100-0118
MP54	7120-1164	2	1	LABEL, NOSE 1610B	28480	7120-1164
MP55	01610-00103	0	1	DECK, MAIN	28480	01610-00103
MP56	01610-00208	6	1	PANEL, REAR	28480	01610-00208
MP57	01610-00202	0	1	PANEL, OUTER-LOGIC LOW VOLTAGE	28480	01610-00202
MP58	01610-00203	1	1	PANEL, LOGIC LEVEL	28480	01610-00203
MP59	01610-00204	2	1	PANEL, SUB-LOGIC LOW VOLTAGE	28480	01610-00204
MP60	01610-00205	3	1	PANEL, OUTER-SUB LL	28480	01610-00205
MP61	5041-0072	9	1	KEY CAP, TRACE RETURN	28480	5041-0072
MP62	01610-00603	5	1	SHIELD, CRT	28480	01610-00603
MP63	01610-01201	1	1	BRACKET, BOARD GUIDE	28480	01610-01201
MP64	01610-01216	8	1	BRACKET, CAP SUPPORT	28480	01610-01216
MP65	01610-01203	3	1	BRACKET, POWER SUPPLY	28480	01610-01203
MP66	01610-01206	6	1	BRACKET, PROBE CONNECTOR	28480	01610-01206
MP67	01610-01208	8	1	BRACKET, C.B.K.	28480	01610-01208
MP68	01610-02301	4	1	KEEPER, CIRCUIT BOARDS	28480	01610-02301
MP69	01610-04102	7	1	COVER, KEYBOARD, TOP	28480	01610-04102
MP70	01610-04103	8	1	COVER, KEYBOARD, BOTTOM	28480	01610-04103

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
MP71	01610-04104	9	1	COVER, H.V. BOX	28480	01610-04104
MP72	01610-04105	0	1	COVER, PROBE CABLE	28480	01610-04105
MP73	01610-04110	7	1	COVER, HP-18	28480	01610-04110
MP74	01610-05501	2	1	BOX, H.V.	28480	01610-05501
MP75	0400-0062	8	1	GROMMET-CHAN NCH .09-IN-GRV-WD	28480	0400-0062
MP76	01610-23701	2	1	SHAFT, POWER SWITCH	28480	01610-23701
MP77	01610-43101	6	1	GUIDE, CIRCUIT BOARD	28480	01610-43101
MP78	01610-64101	2	1	COVER, BOTTOM	28480	01610-64101
MP79	01830-23201	3	1	COUPLER, SWITCH EXTENSION	28480	01830-23201
MP80	1410-0628	0	5	BUSHING-PNL .14-ID .275-LG 1/4-32-TMD	28480	1410-0628
MP81	0400-0010	2	1	GROMMET-RND .25-IN-ID .375-IN-GRV-OD	28480	0400-0010
MP82	1400-0547	1	1	CL-LED-MTG	28480	1400-0547
MP83	1400-0540	4	1	RETAINER RING-LED CLIP 0.270-IN SERRATED	28480	1400-0540
MP84	1251-0218	6	10	LOCK-SUBMIN D CONN	28480	1251-0218
	1251-0670	4	5	CONTACT-CONN U/W POST-TYPE FEM CRP	28480	1251-0670
MP85	5060-9888	3	1	COVER, SIDE W/HANDLE	28480	5060-9888
MP86	01615-01204	9	1	STRAP, GROUNDING	28480	01615-01204
MP87	7120-1254	1	1	NAMEPLATE .312-IN-WD .54-IN-LG AL	28480	7120-1254
MP88	0400-0018	0	1	GROMMET-CHAN NCH .052-IN-TMK-PNL	28480	0400-0018
MP90	0390-0006	3	4	INSULATOR-FLG-BSHG NYLON	28480	0390-0006
MP91	1520-0063	0	1	SHOCK PAD .171-EFF-MGT NPRN-FM .875-WD	28480	1520-0063
MP92	4040-1575	6	1	COVER, KEYBOARD	28480	4040-1575
MP93	00180-09104	3	2	CLIP-GROUND	28480	00180-09104
Q1	1854-0879	3	2	TRANSISTOR NPN DARLINGTON SI PD=75W	04713	MJE6043
Q2	1854-0879	2	6	TRANSISTOR NPN DARLINGTON SI PD=75W	04713	MJE6043
Q3	1854-0558	5	5	TRANSISTOR NPN SI DARL PD=70W FT=1MHZ	28480	1854-0558
Q4	1854-0558	5	5	TRANSISTOR NPN SI DARL PD=70W FT=1MHZ	28480	1854-0558
Q5	1854-0558	5	5	TRANSISTOR NPN SI DARL PD=70W FT=1MHZ	28480	1854-0558
Q6	1854-0558	5	5	TRANSISTOR NPN SI DARL PD=70W FT=1MHZ	28480	1854-0558
Q7	1854-0330	1	1	TRANSISTOR NPN SI PD=21W FT=10MHZ	28480	1854-0330
Q8	1853-0334	3	1	TRANSISTOR PNP SI DARL PD=70W FT=1MHZ	04713	MJE1090
Q9	1854-0558	5	5	TRANSISTOR NPN SI DARL PD=70W FT=1MHZ	28480	1854-0558
R1	0684-1021	7	1	RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
R2	0684-1021	7	1	RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
R3	0684-1021	7	1	RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
R4	0684-1021	7	1	RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
R5	0684-1021	7	1	RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
R6	0687-4751	2	1	RESISTOR 4.7M 10% .5W CC TC=0+1000	01121	EB4751
T1	9100-0426	7	1	POWER TRANSFORMER	28480	9100-0426
T2	01610-66515	6	1	H.V. TRANSFORMER	28480	01610-66515
T3	0960-0420	4	1	MULTIPLIER	28480	0960-0420
V1	2090-0028	5	1	TUBE-ELECTRON CRT	28480	2090-0028
W1	8120-1351	0	1	CABLE ASSY 3-CNDCT MGP-JKT	28480	8120-1351
W1	8120-1369	0	1	CABLE ASSY 3-CNDCT GRA-JKT 7.62-MM-OD	28480	8120-1369
W1	8120-1378	1	1	CABLE ASSY 18AWG 1-CNDCT JGK-JKT	28480	8120-1378
W1	8120-1689	7	1	CABLE ASSY 3-CNDCT MGP-JKT	28480	8120-1689
W1	8120-2104	3	1	CABLE ASSY 3-CNDCT GRA-JKT	28480	8120-2104
W2				NOT ASSIGNED		
W3	01610-61604	4	1	CABLE, THRESHOLD	28480	01610-61604
W4	01610-61602	2	1	CABLE, CLOCK PROBE	28480	01610-61602
W5	01610-61616	8	1	CABLE ASSEMBLY, POD # 1	28480	01610-61616
W6	01610-61617	9	1	CABLE ASSEMBLY, POD # 2	28480	01610-61617
W7	01610-61618	0	1	CABLE ASSEMBLY, POD # 3	28480	01610-61618
W8	01610-61619	1	1	CABLE ASSEMBLY, POD # 4	28480	01610-61619
W9	01610-61608	8	1	CABLE, KEYBOARD	28480	01610-61608
W10	01610-61635	2	1	CABLE, H.V. PRIMARY	28480	01610-61635
W11	01610-61635	1	1	CABLE ASSEMBLY, TRANS CON	28480	01610-61635
W12	01610-61612	4	1	CABLE, X-Y-Z-AMP	28480	01610-61612
W13		4	2	CABLE, TRANSISTOR	28480	01610-61638
W14	01610-61620	4	1	CABLE, TRANSISTOR	28480	01610-61620
W15	01610-61621	5	1	CABLE, EXTEND 16-P	28480	01610-61621
W16	01610-61603	3	1	CABLE ASSEMBLY, PRINTER	28480	01610-61603
W17	01610-61622	6	1	CABLE, EXTEND 14-P	28480	01610-61622
W18	01610-61623	7	1	CABLE, ACQ INTERCONNECT # 1	28480	01610-61623
W19	01610-61624	8	1	CABLE, ACQ INTERCONNECT # 2	28480	01610-61624
W20	64100-61617	4	2	CABLE ASSEMBLY, 3-CONDUCTOR	28480	64100-61617
W21	64100-61617	4	2	CABLE ASSEMBLY, 3-CONDUCTOR	28480	64100-61617
W22	01610-61606	6	1	CABLE, ACQ INTERCONNECT 1	28480	01610-61606
W23	01610-61607	7	1	CABLE, ACQ INTERCONNECT 2	28480	01610-61607
W24	64100-61617	4	2	CABLE, XSTER	28480	64100-61617
W25	64100-61617	4	2	CABLE, XSTER	28480	64100-61617

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1	01610-66524	7	2	STATE RECOG BOARD ASSEMBLY	28480	01610-66524
A1C1-						
A1C83	0160-2055	9	277	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A1C84	0140-0175	8	2	CAPACITOR-FXD 39PF +-2% 300VDC MICA	72136	DM15E390G0300HV1CR
A1C85	0140-0175	8		CAPACITOR-FXD 39PF +-2% 300VDC MICA	72136	DM15E390G0300HV1CR
A1C86	0160-2202	8	3	CAPACITOR-FXD 75PF +-5% 300VDC MICA	28480	0160-2202
A1C87	0180-0229	7	9	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1C88	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1C89	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1C90	0160-2201	7	2	CAPACITOR-FXD 51PF +-5% 300VDC MICA	28480	0160-2201
A1C91	0160-2020	8	2	CAPACITOR-FXD 910PF +-5% 100VDC MICA	28480	0160-2020
A1C92	0160-2020	8		CAPACITOR-FXD 910PF +-5% 100VDC MICA	28480	0160-2020
A1C93	0160-2255	3	8	CAPACITOR-FXD 2.2UF+-20% 20VDC TA	72982	301-000-COM0-829C
A1C94	0160-2255	3		CAPACITOR-FXD 2.2UF+-20% 20VDC TA	72982	301-000-COM0-829C
A1C95	0160-2255	3		CAPACITOR-FXD 2.2UF+-20% 20VDC TA	72982	301-000-COM0-829C
A1C96	0160-2255	3		CAPACITOR-FXD 2.2UF+-20% 20VDC TA	72982	301-000-COM0-829C
A1C97	0160-2255	3		CAPACITOR-FXD 2.2UF+-20% 20VDC TA	72982	301-000-COM0-829C
A1C98	0160-2255	3		CAPACITOR-FXD 2.2UF+-20% 20VDC TA	72982	301-000-COM0-829C
A1C99	0160-2255	3		CAPACITOR-FXD 2.2UF+-20% 20VDC TA	72982	301-000-COM0-829C
A1C100	0160-2255	3		CAPACITOR-FXD 2.2UF+-20% 20VDC TA	72982	301-000-COM0-829C
A1C101	0160-2201	7	1	CAPACITOR-FXD 51PF +-5% 300VDC MICA	28480	0160-2201
A1C102	0140-0176	9		CAPACITOR-FXD 100PF +-2% 300VDC MICA	72136	DM15F101G0300HV1CR
A1CR1	1901-0040	1	57	DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A1CR2				NOT ASSIGNED		
A1CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A1CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A1J1	1251-4542	7	5	CONNECTOR 26-PIN M POST TYPE	28480	1251-4542
A1J2	1251-4542	7		CONNECTOR 26-PIN M POST TYPE	28480	1251-4542
A1J3	1251-4542	7		CONNECTOR 26-PIN M POST TYPE	28480	1251-4542
A1J4	1251-4542	7		CONNECTOR 26-PIN M POST TYPE	28480	1251-4542
A1J5	1251-4542	7		CONNECTOR 26-PIN M POST TYPE	28480	1251-4542
A1J6	1251-4541	6	1	CONNECTOR 14-PIN M POST TYPE	28480	1251-4541
A1L1	9100-2247	4	2	COIL-MLD 100NH 10% Q=34 .095DX.25LG-NOM	28480	9100-2247
A1L2	9100-2247	4		COIL-MLD 100NH 10% Q=34 .095DX.25LG-NOM	28480	9100-2247
A1R1	0698-3381	5	10	RESISTOR 150 5% .125W CC TC=-330/+800	01121	BB1515
A1R2	0698-3381	5		RESISTOR 150 5% .125W CC TC=-330/+800	01121	BB1515
A1R3	0698-3381	5		RESISTOR 150 5% .125W CC TC=-330/+800	01121	BB1515
A1R4	0698-3381	5		RESISTOR 150 5% .125W CC TC=-330/+800	01121	BB1515
A1R5	0698-3381	5		RESISTOR 150 5% .125W CC TC=-330/+800	01121	BB1515
A1R6	0698-3381	5		RESISTOR 150 5% .125W CC TC=-330/+800	01121	BB1515
A1R7	0698-3381	5		RESISTOR 150 5% .125W CC TC=-330/+800	01121	BB1515
A1R8	0698-3381	5		RESISTOR 150 5% .125W CC TC=-330/+800	01121	BB1515
A1R9	0698-3381	5		RESISTOR 150 5% .125W CC TC=-330/+800	01121	BB1515
A1R10	0698-3381	5		RESISTOR 150 5% .125W CC TC=-330/+800	01121	BB1515
A1R11	0757-0394	0	18	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1R12	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1R13	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1R14	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1R15	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1R16	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1R17	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1R18	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1R19	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1R20	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1R21	0698-3381	5	16	RESISTOR 150 5% .125W CC TC=-330/+800	01121	BB1515
A1R22	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A1R23	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A1R24	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A1R25	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A1R26	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A1R27	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A1R28	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A1R29	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A1R30	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A1R31	0757-0465	6	21	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A1R32	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A1R33	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A1R34	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A1R35	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F

See introduction to this section for ordering information

*Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1R36	0757-0465	6		RESISTOR 100K 1% .125W F TC0+/-100	24546	C4-1/8-T0=1003-F
A1R37	0757-0465	6		RESISTOR 100K 1% .125W F TC0+/-100	24546	C4-1/8-T0=1003-F
A1R38	0757-0465	6		RESISTOR 100K 1% .125W F TC0+/-100	24546	C4-1/8-T0=1003-F
A1R39	0757-0465	6		RESISTOR 100K 1% .125W F TC0+/-100	24546	C4-1/8-T0=1003-F
A1R40	0757-0465	6		RESISTOR 100K 1% .125W F TC0+/-100	24546	C4-1/8-T0=1003-F
A1R41	0757-0465	6		RESISTOR 100K 1% .125W F TC0+/-100	24546	C4-1/8-T0=1003-F
A1R42	0757-0465	6		RESISTOR 100K 1% .125W F TC0+/-100	24546	C4-1/8-T0=1003-F
A1R43	0757-0465	6		RESISTOR 100K 1% .125W F TC0+/-100	24546	C4-1/8-T0=1003-F
A1R44	0757-0465	6		RESISTOR 100K 1% .125W F TC0+/-100	24546	C4-1/8-T0=1003-F
A1R45	0757-0465	6		RESISTOR 100K 1% .125W F TC0+/-100	24546	C4-1/8-T0=1003-F
A1R46	0757-0465	6		RESISTOR 100K 1% .125W F TC0+/-100	24546	C4-1/8-T0=1003-F
A1R47	0757-0465	6		RESISTOR 100K 1% .125W F TC0+/-100	24546	C4-1/8-T0=1003-F
A1R48	0757-0465	6		RESISTOR 100K 1% .125W F TC0+/-100	24546	C4-1/8-T0=1003-F
A1R49	0698-3132	4	1	RESISTOR 261 1% .125W F TC0+/-100	24546	C4-1/8-T0=2610-F
A1R50	0698-3132	4		RESISTOR 261 1% .125W F TC0+/-100	24546	C4-1/8-T0=2610-F
A1R51	0757-0282	5	5	RESISTOR 221 1% .125W F TC0+/-100	24546	C4-1/8-T0=221R-F
A1R52	0757-0282	5		RESISTOR 221 1% .125W F TC0+/-100	24546	C4-1/8-T0=221R-F
A1R53	0757-0282	5		RESISTOR 221 1% .125W F TC0+/-100	24546	C4-1/8-T0=221R-F
A1R54	0757-0282	5		RESISTOR 221 1% .125W F TC0+/-100	24546	C4-1/8-T0=221R-F
A1R55	0757-0282	5		RESISTOR 221 1% .125W F TC0+/-100	24546	C4-1/8-T0=221R-F
A1R56	0698-0084	9	1	RESISTOR 2.15K 1% .125W F TC0+/-100	24546	C4-1/8-T0=2151-F
A1R57	0757-0280	3	64	RESISTOR 1K 1% .125W F TC0+/-100	24546	C4-1/8-T0=1001-F
A1R58	0757-0280	3		RESISTOR 1K 1% .125W F TC0+/-100	24546	C4-1/8-T0=1001-F
A1R59	0757-0280	3		RESISTOR 1K 1% .125W F TC0+/-100	24546	C4-1/8-T0=1001-F
A1R60	0757-0280	3		RESISTOR 1K 1% .125W F TC0+/-100	24546	C4-1/8-T0=1001-F
A1R61	0757-0415	6	11	RESISTOR 475 1% .125W F TC0+/-100	24546	C4-1/8-T0=475R-F
A1R62	0757-0415	6		RESISTOR 475 1% .125W F TC0+/-100	24546	C4-1/8-T0=475R-F
A1R63	0757-0415	6		RESISTOR 475 1% .125W F TC0+/-100	24546	C4-1/8-T0=475R-F
A1R64	0757-0415	6		RESISTOR 475 1% .125W F TC0+/-100	24546	C4-1/8-T0=475R-F
A1R65	0757-0415	6		RESISTOR 475 1% .125W F TC0+/-100	24546	C4-1/8-T0=475R-F
A1R66	0757-0415	6		RESISTOR 475 1% .125W F TC0+/-100	24546	C4-1/8-T0=475R-F
A1R67	0757-0413	4	3	RESISTOR 392 1% .125W F TC0+/-100	24546	C4-1/8-T0=392R-F
A1R68	0757-0413	4		RESISTOR 392 1% .125W F TC0+/-100	24546	C4-1/8-T0=392R-F
A1R69	0757-0413	4		RESISTOR 392 1% .125W F TC0+/-100	24546	C4-1/8-T0=392R-F
A1R70	0698-3441	8	2	RESISTOR 215 1% .125W F TC0+/-100	24546	C4-1/8-T0=215R-F
A1R71	0757-0402	1	2	RESISTOR 110 1% .125W F TC0+/-100	24546	C4-1/8-T0=111-F
A1R72	0757-0402	1		RESISTOR 110 1% .125W F TC0+/-100	24546	C4-1/8-T0=111-F
A1R73	0757-0404	3	2	RESISTOR 130 1% .125W F TC0+/-100	24546	C4-1/8-T0=131-F
A1R74	0757-0404	3		RESISTOR 130 1% .125W F TC0+/-100	24546	C4-1/8-T0=131-F
A1R75	0757-0407	6	4	RESISTOR 200 1% .125W F TC0+/-100	24546	C4-1/8-T0=201-F
A1R76	0757-0408	7	6	RESISTOR 243 1% .125W F TC0+/-100	24546	C4-1/8-T0=243R-F
A1R77	0757-0408	7		RESISTOR 243 1% .125W F TC0+/-100	24546	C4-1/8-T0=243R-F
A1R78	0757-0408	7		RESISTOR 243 1% .125W F TC0+/-100	24546	C4-1/8-T0=243R-F
A1R79	0757-0416	7	18	RESISTOR 511 1% .125W F TC0+/-100	24546	C4-1/8-T0=511R-F
A1R80	0757-0417	8	1	RESISTOR 562 1% .125W F TC0+/-100	24546	C4-1/8-T0=562R-F
A1R81	0757-0418	9	6	RESISTOR 619 1% .125W F TC0+/-100	24546	C4-1/8-T0=619R-F
A1R82	0757-1094	9	2	RESISTOR 1.47K 1% .125W F TC0+/-100	24546	C4-1/8-T0=1471-F
A1TP1	1251-2229	3	4	CONNECTOR-SGL CONT 8KT .033-IN-BSC-8Z	28480	1251-2229
A1TP10	1251-4045	5	4		28480	1251-4045
A1TP2	1251-2229	3		CONNECTOR-SGL CONT 8KT .033-IN-BSC-8Z	28480	1251-2229
A1TP20	1251-4045	5			28480	1251-4045
A1TP3	0360-0535	0	29	TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A1U1	1820-1052	5	11	IC XLTR ECL ECL-T0-TTL QUAD 2-INP	04713	MC10125L
A1U2	1820-1052	5		IC XLTR ECL ECL-T0-TTL QUAD 2-INP	04713	MC10125L
A1U3	1820-1052	5		IC XLTR ECL ECL-T0-TTL QUAD 2-INP	04713	MC10125L
A1U4	1820-1052	5		IC XLTR ECL ECL-T0-TTL QUAD 2-INP	04713	MC10125L
A1U5	1820-1052	5		IC XLTR ECL ECL-T0-TTL QUAD 2-INP	04713	MC10125L
A1U6	1820-1052	5		IC XLTR ECL ECL-T0-TTL QUAD 2-INP	04713	MC10125L
A1U7	1820-1052	5		IC XLTR ECL ECL-T0-TTL QUAD 2-INP	04713	MC10125L
A1U8	1820-1052	5		IC XLTR ECL ECL-T0-TTL QUAD 2-INP	04713	MC10125L
A1U9	1820-1400	7	2	IC GATE ECL AND QUAD 2-INP	04713	MC10104P
A1U10	1820-1359	5	1	IC MUXR/DATA-SEL ECL 4-T0-1-LINE DUAL	04713	MC10174P
A1U11	1820-0817	8	1	IC FF ECL D-M/S DUAL	04713	MC10131P
A1U12	1820-1173	1	4	IC XLTR ECL TTL-T0-ECL QUAD 2-INP	04713	MC10124L
A1U13	1820-1052	5		IC XLTR ECL ECL-T0-TTL QUAD 2-INP	04713	MC10125L
A1U14	1820-1281	2	1	IC DCDR TTL LS 2-T0-4-LINE DUAL 2-INP	01295	8N74L8139N
A1U15	1820-1144	6	2	IC GATE TTL LS NOR QUAD 2-INP	01295	8N74L802N
A1U16	1820-1423	4	4	IC MV TTL LS MONOSTBL RETRIG DUAL	01295	8N74L8123N
A1U17	1820-1423	4		IC MV TTL LS MONOSTBL RETRIG DUAL	01295	8N74L8123N
A1U18	1826-0139	9	3	OP AMP GP DUAL 8-DIP-P	01928	CA1458G
A1U19	1820-1788	4	8	IC CNTR ECL BIN SYNCHRO POS-EDGE-TRIG	07263	F10016DC
A1U20	1820-1788	4		IC CNTR ECL BIN SYNCHRO POS-EDGE-TRIG	07263	F10016DC
A1U21	1820-1788	4		IC CNTR ECL BIN SYNCHRO POS-EDGE-TRIG	07263	F10016DC
A1U22	1820-1788	4		IC CNTR ECL BIN SYNCHRO POS-EDGE-TRIG	07263	F10016DC
A1U23	1820-1788	4		IC CNTR ECL BIN SYNCHRO POS-EDGE-TRIG	07263	F10016DC
A1U24	1820-1788	4		IC CNTR ECL BIN SYNCHRO POS-EDGE-TRIG	07263	F10016DC
A1U25	1820-1788	4		IC CNTR ECL BIN SYNCHRO POS-EDGE-TRIG	07263	F10016DC

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1U26	1820-1788	4		IC CNTR ECL BIN SYNCHRD POS-EDGE-TRIG	07263	F10016DC
A1U27	1820-1225	4	3	IC FF ECL D-M/S DUAL	04713	MC10231P
A1U28	1820-0809	8	10	IC RCVR ECL LINE RCVR QUAD 2-INP	04713	MC10115P
A1U29	1816-1338	1	2	IC ECL 64-BIT RAM STAT 6-NS	07263	10145APC
A1U30	1820-0801	0	2	IC GATE ECL OR-NOR QUAD 2-INP	04713	MC10101P
A1U31	1820-1173	1		IC XLTR ECL TTL-TO-ECL QUAD 2-INP	04713	MC10124L
A1U32	1820-1198	0	3	IC GATE TTL L8 NAND QUAD 2-INP	01295	8N74LS03N
A1U33	1820-1423	4		IC MV TTL L8 MONOSTBL RETRIG DUAL	01295	8N74LS123N
A1U34	1820-0693	8	10	IC FF TTL 8 D-TYPE POS-EDGE-TRIG	01295	8N74874N
A1U35	1820-0693	8		IC FF TTL 8 D-TYPE POS-EDGE-TRIG	01295	8N74874N
A1U44	0490-1079	4	2	RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-1079
A1U45	1820-1225	4		IC FF ECL D-M/S DUAL	04713	MC10231P
A1U46	1820-1224	3	1	IC RCVR ECL LINE RCVR TPL 2-INP	04713	MC10216P
A1U47	1820-0809	8		IC RCVR ECL LINE RCVR QUAD 2-INP	04713	MC10115P
A1U48	1820-0801	0		IC GATE ECL OR-NOR QUAD 2-INP	04713	MC10101P
A1U49	1820-1052	5		IC XLTR ECL ECL-TO-TTL QUAD 2-INP	04713	MC10125L
A1U50	1820-1201	6	2	IC GATE TTL L8 AND QUAD 2-INP	01295	8N74LS08N
A1U51	1820-0693	8		IC FF TTL 8 D-TYPE POS-EDGE-TRIG	01295	8N74874N
A1U52	1820-1423	4		IC MV TTL L8 MONOSTBL RETRIG DUAL	01295	8N74LS123N
A1U53	1820-1197	9	7	IC GATE TTL L8 NAND QUAD 2-INP	01295	8N74LS00N
A1U54	1826-0139	9		OP AMP GP DUAL 8-DIP-P	01928	CA1458G
A1U55	1820-0809	8		IC RCVR ECL LINE RCVR QUAD 2-INP	04713	MC10115P
A1U56	1820-0809	8		IC RCVR ECL LINE RCVR QUAD 2-INP	04713	MC10115P
A1U57	1820-0809	8		IC RCVR ECL LINE RCVR QUAD 2-INP	04713	MC10115P
A1U58	1820-0809	8		IC RCVR ECL LINE RCVR QUAD 2-INP	04713	MC10115P
A1U59	1820-0809	8		IC RCVR ECL LINE RCVR QUAD 2-INP	04713	MC10115P
A1U60	1820-0809	8		IC RCVR ECL LINE RCVR QUAD 2-INP	04713	MC10115P
A1U61	1820-0809	8		IC RCVR ECL LINE RCVR QUAD 2-INP	04713	MC10115P
A1U62	1820-0809	8		IC RCVR ECL LINE RCVR QUAD 2-INP	04713	MC10115P
A1U63	0490-1079	4		RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-1079
A1U63	1820-1225	4		IC FF ECL D-M/S DUAL	04713	MC10231P
A1U65	1820-1400	7		IC GATE ECL AND QUAD 2-INP	04713	MC10104P
A1U66	1816-1338	1		IC ECL 64-BIT RAM STAT 6-NS	07263	10145APC
A1U67	1820-1173	1		IC XLTR ECL TTL-TO-ECL QUAD 2-INP	04713	MC10124L
A1U68	1820-1191	3	1	IC FF TTL 8 D-TYPE POS-EDGE-TRIG COM	01295	8N748175N
A1U69	1820-1205	0	2	IC GATE TTL L8 AND DUAL 4-INP	01295	8N74LS21N
A1U70	1820-1199	1	12	IC INV TTL L8 HEX 1-INP	01295	8N74LS04N
A1U71	1820-0693	8		IC FF TTL 8 D-TYPE POS-EDGE-TRIG	01295	8N74874N
A1U72	1820-1130	0	2	IC GATE TTL 8 NAND 13-INP	01295	8N748133N
A1U73	1826-0139	9		OP AMP GP DUAL 8-DIP-P	01928	CA1458G
A1U74	1810-0273	9	19	NETWORK-RES 10-PIN-8IP .1-PIN-8PCG	01121	210A471
A1U75	1810-0273	9		NETWORK-RES 10-PIN-8IP .1-PIN-8PCG	01121	210A471
A1U76	1810-0273	9		NETWORK-RES 10-PIN-8IP .1-PIN-8PCG	01121	210A471
A1U77	1810-0273	9		NETWORK-RES 10-PIN-8IP .1-PIN-8PCG	01121	210A471
A1U78	1810-0273	9		NETWORK-RES 10-PIN-8IP .1-PIN-8PCG	01121	210A471
A1U79	1810-0273	9		NETWORK-RES 10-PIN-8IP .1-PIN-8PCG	01121	210A471
A1U80	1810-0273	9		NETWORK-RES 10-PIN-8IP .1-PIN-8PCG	01121	210A471
A1U81	1810-0273	9		NETWORK-RES 10-PIN-8IP .1-PIN-8PCG	01121	210A471
A1U82	1810-0273	9		NETWORK-RES 10-PIN-8IP .1-PIN-8PCG	01121	210A471
A1U83	1810-0273	9		NETWORK-RES 10-PIN-8IP .1-PIN-8PCG	01121	210A471
A1U84	1810-0273	9		NETWORK-RES 10-PIN-8IP .1-PIN-8PCG	01121	210A471
A1U85	1810-0273	9		NETWORK-RES 10-PIN-8IP .1-PIN-8PCG	01121	210A471
A1U86	1810-0273	9		NETWORK-RES 10-PIN-8IP .1-PIN-8PCG	01121	210A471
A1U87	1810-0273	9		NETWORK-RES 10-PIN-8IP .1-PIN-8PCG	01121	210A471
A1U88	1810-0273	9		NETWORK-RES 10-PIN-8IP .1-PIN-8PCG	01121	210A471
A1U89	1810-0273	9		NETWORK-RES 10-PIN-8IP .1-PIN-8PCG	01121	210A471
A1U90	1810-0273	9		NETWORK-RES 10-PIN-8IP .1-PIN-8PCG	01121	210A471
A1U91	1810-0273	9		NETWORK-RES 10-PIN-8IP .1-PIN-8PCG	01121	210A471
A1U92	1810-0273	9		NETWORK-RES 10-PIN-8IP .1-PIN-8PCG	01121	210A471
A1U93	1810-0277	3	1	NETWORK-RES 10-PIN-8IP .1-PIN-8PCG	01121	210A222
A1XU11	1200-0473	11		SOCKET-IC 16 CONT DIP-SLDR	28480	1200-0473
A1XU53	1200-0474	9	22	SOCKET-IC 14 CONT DIP-SLDR	28480	1200-0474
A2	01610-66526	9	2	INDEX BOARD ASSEMBLY	28480	01610-66526
A2C1	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C2	0160-2055	9	49	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C3	0160-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X901082
A2C4	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C5	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C6	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C7	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C8	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C9	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C10	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C11	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C12	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C13	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C14	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C15	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055

See introduction to this section for ordering information

*Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A2C16	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C17	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C18	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C19	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C20	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C21	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C22	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C23	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C24	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C25	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C26	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C27	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C28	0160-2204	0	2	CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2204
A2C29	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C30	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C31	0160-2263	1	1	CAPACITOR-FXD 18PF +-5% 500 VDC CER 0+-30	28480	0160-2263
A2C32	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C33	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C34	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C35	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C36	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C37	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C38	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C39	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C40	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C41	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C42	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C43	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C44	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C45	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C46	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C47	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C48	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C49	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C50	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C51	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C52	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2L1	9100-2264	5	2	COIL-MLD 6.8UH 10% Q=50 .095DX.25LG-NOM	28480	9100-2264
A2R1	1810-0295	5	4	NETWORK-RES 10-PIN-SIP .1-PIN-SPCG	28480	1810-0295
A2R2	1810-0295	5		NETWORK-RES 10-PIN-SIP .1-PIN-SPCG	28480	1810-0295
A2R3	1810-0295	5		NETWORK-RES 10-PIN-SIP .1-PIN-SPCG	28480	1810-0295
A2R4	1810-0295	5		NETWORK-RES 10-PIN-SIP .1-PIN-SPCG	28480	1810-0295
A2R5	1810-0289	7	4	NETWORK-RES 10-PIN-SIP .1-PIN-SPCG	28480	1810-0289
A2R6	1810-0289	7		NETWORK-RES 10-PIN-SIP .1-PIN-SPCG	28480	1810-0289
A2R7	1810-0289	7		NETWORK-RES 10-PIN-SIP .1-PIN-SPCG	28480	1810-0289
A2R8	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2R9	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2R10	0757-0418	9		RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A2R11	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2R12				NOT ASSIGNED		
A2R13	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2R14	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2R15	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2R16				NOT ASSIGNED		
A2R17				NOT ASSIGNED		
A2R18	1810-0289	7		NETWORK-RES 10-PIN-SIP .1-PIN-SPCG	28480	1810-0289
A2R19	0684-0271	7	5	RESISTOR 2.7 10% .25W FC TC=-400/+500	01121	CB27G1
A2R20	0684-0271	7		RESISTOR 2.7 10% .25W FC TC=-400/+500	01121	CB27G1
A2U1	1816-0787	2	24	IC TTL 64-BIT RAM 35-N8 0-C	01295	8N748289N
A2U24	1820-1323	3	3	IC GATE TTL 8 NAND 8-INP	01295	8N74830N
A2U25	1820-0685	8	11	IC GATE TTL 8 NAND TPL 3-INP	01295	8N74810N
A2U26	1820-0685	8		IC GATE TTL 8 NAND TPL 3-INP	01295	8N74810N
A2U28	1820-0685	8		IC GATE TTL 8 NAND TPL 3-INP	01295	8N74810N
A2U29	1820-1411	0	12	IC LCH TTL LS D-TYPE 4-BIT	01295	8N74LS75N
A2U30	1816-0724	7	7	IC TTL 64-BIT RAM 35-N8 3-B	01295	8N748169N
A2U31	1820-1411	0		IC LCH TTL LS D-TYPE 4-BIT	01295	8N74LS75N
A2U32	1816-0724	7		IC TTL 64-BIT RAM 35-N8 3-B	01295	8N748169N
A2U33	1820-1323	3		IC GATE TTL 8 NAND 8-INP	01295	8N74830N
A2U34	1820-0685	8		IC GATE TTL 8 NAND TPL 3-INP	01295	8N74810N
A2U35	1820-0685	8		IC GATE TTL 8 NAND TPL 3-INP	01295	8N74810N
A2U36	1820-0685	8		IC GATE TTL 8 NAND TPL 3-INP	01295	8N74810N
A2U37	1820-0681	4	7	IC GATE TTL 8 NAND QUAD 2-INP	01295	8N74800N
A2U38	1820-1240	3	1	IC DCDR TTL 8 3-T0-8-LINE 3-INP	01295	8N748138N
A2U39	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	8N74LS04N
A2U40	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	8N74LS04N
A2U41	1820-0693	8		IC FF TTL 8 D-TYPE POS-EDGE-TRIG	01295	8N74874N
A2U42	1820-0693	8		IC FF TTL 8 D-TYPE POS-EDGE-TRIG	01295	8N74874N

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A2U43	1820-1197	9		IC GATE TTL LS NAND QUAD 2-INP	01295	8N74L800N
A2U44	1820-0054	5	1	IC GATE TTL NAND QUAD 2-INP	01295	8N7400N
A2U45	1820-1322	2	3	IC GATE TTL S NOR QUAD 2-INP	01295	8N74802N
A2U46	1820-1015	0	1	IC MUXR/DATA-SEL TTL S 2-TO-1-LINE QUAD	01295	8N748158N
A2U47	1816-0724	7		IC TTL 64-BIT RAM 35-NS 3-S	01295	8N748189N
A2U48	1820-1323	3		IC GATE TTL S NAND 8-INP	01295	8N74530N
A2U49	1820-0681	4		IC GATE TTL S NAND QUAD 2-INP	01295	8N74800N
A2U50	1820-1475	6	20	IC CNTR TTL S BIN SYNCHRO POS-EDGE-TRIG	07263	938160C
A2U51	1820-1411	0		IC LCH TTL LS D-TYPE 4-BIT	01295	8N74L875N
A2U52	1816-0724	7		IC TTL 64-BIT RAM 35-NS 3-S	01295	8N748189N
A2U53	1820-1073	0	4	IC GATE TTL S EXCL-NOR QUAD 2-INP	18324	N82542N
A2U54	1820-1475	6		IC CNTR TTL S BIN SYNCHRO POS-EDGE-TRIG	07263	938160C
A2U55	1820-1282	3	3	IC FF TTL LS J-K BAR POS-EDGE-TRIG	01295	8N74L8109AN
A2U56	1820-1475	6		IC CNTR TTL S BIN SYNCHRO POS-EDGE-TRIG	07263	938160C
A2U57	1820-1411	0		IC LCH TTL LS D-TYPE 4-BIT	01295	8N74L875N
A2U58	1816-0724	7		IC TTL 64-BIT RAM 35-NS 3-S	01295	8N748189N
A2U59	1820-1073	0		IC GATE TTL S EXCL-NOR QUAD 2-INP	18324	N82542N
A2U60	1820-1475	6		IC CNTR TTL S BIN SYNCHRO POS-EDGE-TRIG	07263	938160C
A2U61	1820-1367	5	3	IC GATE TTL S AND QUAD 2-INP	01295	8N74808N
A2U62	1820-1475	6		IC CNTR TTL S BIN SYNCHRO POS-EDGE-TRIG	07263	938160C
A2U63	1820-1411	0		IC LCH TTL LS D-TYPE 4-BIT	01295	8N74L875N
A2U64	1816-0724	7		IC TTL 64-BIT RAM 35-NS 3-S	01295	8N748189N
A2U65	1820-1073	0		IC GATE TTL S EXCL-NOR QUAD 2-INP	18324	N82542N
A2U66	1820-1475	6		IC CNTR TTL S BIN SYNCHRO POS-EDGE-TRIG	07263	938160C
A2U67	1820-0691	6	2	IC GATE TTL S AND-OR-INV	01295	8N74864N
A2U68	1820-1475	6		IC CNTR TTL S BIN SYNCHRO POS-EDGE-TRIG	07263	938160C
A2U69	1820-1411	0		IC LCH TTL LS D-TYPE 4-BIT	01295	8N74L875N
A2U70	1816-0724	7		IC TTL 64-BIT RAM 35-NS 3-S	01295	8N748189N
A2U71	1820-1073	0		IC GATE TTL S EXCL-NOR QUAD 2-INP	18324	N82542N
A2U72	1820-1475	6		IC CNTR TTL S BIN SYNCHRO POS-EDGE-TRIG	07263	938160C
A2XU1-24	1200-0607	0	33	SOCKET-IC 16-CONT DIP-SLDR	28480	1200-0607
A3	01610-66527	0	2	MEASUREMENT BOARD ASSEMBLY	28480	01610-66527
A3C1	0180-0228	6	2	CAPACITOR-FXD 22UF+/-10% 15VDC TA	56289	150D226X9015B2
A3C2	0180-0229	7		CAPACITOR-FXD 33UF+/-10% 10VDC TA	56289	150D336X9010B2
A3C3	0180-0229	7		CAPACITOR-FXD 33UF+/-10% 10VDC TA	56289	150D336X9010B2
A3C4	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3C5	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3C6	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3C7	0140-0190	8	1	CAPACITOR-FXD 56PF +/-5% 300VDC MICA	72136	DM15E60J0300WV1CR
A3C8	0121-0046	2	6	CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A3C9	0140-0205	5	1	CAPACITOR-FXD 62PF +/-5% 300VDC MICA	72136	DM15E620J0300WV1CR
A3C10	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3C11	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3C12	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3C13	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3C14	0121-0046	2		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A3C15*	0140-0218	0	2	CAPACITOR-FXD 160PF +/-2% 300VDC MICA	28480	0140-0218
A3C16*	0140-0202	2	2	CAPACITOR-FXD 15PF +/-5% 500VDC MICA	28480	0140-0202
A3C17	0121-0046	2		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A3C18*	0140-0218	0		CAPACITOR-FXD 160PF +/-2% 300VDC MICA	28480	0140-0218
A3C19*	0140-0202	2		CAPACITOR-FXD 15PF +/-5% 500VDC MICA	28480	0140-0202
A3C20	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3C21	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3C22	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3C23	0121-0046	2		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A3C24	0140-0192	9	1	CAPACITOR-FXD 68PF +/-5% 300 VDC MICA	28480	0140-0192
A3C25	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3C26	0121-0046	2		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A3C27	0160-2101	6	1	CAPACITOR-FXD 8200 PF +/-2% 500 VDC MICA	28480	0160-2101
A3C28	0121-0046	2		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A3C29	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3C30	0160-2203	9	1	CAPACITOR-FXD 91PF +/-5% 300VDC MICA 0+70	28480	0160-2203
A3C31	0160-2259	5	1	CAPACITOR-FXD 12PF +/-5% 500VDC CER 0+-30	28480	0160-2259
A3C32	0160-2250	6	1	CAPACITOR-FXD 5.1PF +/-0.25PF 500VDC CER	28480	0160-2250
A3C33	0140-0197	4	1	CAPACITOR-FXD 180PF +/-5% 300VDC MICA	72136	DM15F181J0300WV1CR
A3C34-						
A3C73	0160-2055	9	40	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3C74	0180-0106	9	4	CAPACITOR-FXD 60UF +/-20% 6VDC TA	56289	150D60X0006B2
A3CR1	1901-0045	6	10	DIODE-PWR RECT 100V 750MA DO-29	28480	1901-0045
A3CR2	1901-0045	6		DIODE-PWR RECT 100V 750MA DO-29	28480	1901-0045
A3CR3	1901-0179	7	6	DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A3CR4	1901-0179	7		DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A3CR5	1901-0179	7		DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3CR6	1901-0179	7	6	DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A3CR7	1901-0179	7		DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A3CR8	1901-0535	9		DIODE-8CHOTTKY	28480	1901-0535
A3CR9	1901-0179	7		DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A3L1	9170-0016	8	5	CORE-SHIELDING BEAD	28480	9170-0016
A3L2	9170-0016	8		CORE-SHIELDING BEAD	28480	9170-0016
A3L3	9170-0016	8		CORE-SHIELDING BEAD	28480	9170-0016
A3L4	9170-0016	8		CORE-SHIELDING BEAD	28480	9170-0016
A3L5	9170-0016	8		CORE-SHIELDING BEAD	28480	9170-0016
A3L6	9100-2258	7	1	COIL-MLD 1.2UH 10% Q=32 .095DX,25LG-NOM	28480	9100-2258
A3L7	9100-2264	5		COIL-MLD 6.8UH 10% Q=50 .095DX,25LG-NOM	28480	9100-2264
A3L8	9100-2257	6		COIL-MLD 820NH 10% Q=32 .095DX,25LG-NOM	28480	9100-2257
A3L9	9100-2257	6		COIL-MLD 820NH 10% Q=32 .095DX,25LG-NOM	28480	9100-2257
A3MP1	1205-0095	0	1	HEAT SINK SGL TO-5/TO-39-PKG	30161	3225B
A3MP2	0340-0435	7	1	INSULATOR-XSTR DAP-8L	28480	0340-0435
A3Q1	1853-0036	2	3	TRANSISTOR PNP 81 PD=310MH FT=250MHZ	28480	1853-0036
A3Q2	1853-0314	9	2	TRANSISTOR PNP 2N2905A 81 TO-39 PD=600MH	04713	2N2905A
A3R1	0757-0280	3	16	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A3R2	0757-0416	9		RESISTOR 619 1% .125W F TC=0+-100	24546	C4=1/8-T0=619R-F
A3R3	0698-3432	7		RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55=1/8-T0=26R1-F
A3R4	0757-0726	2		RESISTOR 511 1% .25W F TC=0+-100	24546	C5=1/4-T0=511R-F
A3R5	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4=1/8-T0=511R-F
A3R6	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A3R7	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A3R8	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A3R9	0757-0419	0		RESISTOR 681 1% .125W F TC=0+-100	24546	C4=1/8-T0=681R-F
A3R10	0757-0419	0		RESISTOR 681 1% .125W F TC=0+-100	24546	C4=1/8-T0=681R-F
A3R11	0757-0726	2		RESISTOR 511 1% .25W F TC=0+-100	24546	C5=1/4-T0=511R-F
A3R12	0757-0726	2		RESISTOR 511 1% .25W F TC=0+-100	24546	C5=1/4-T0=511R-F
A3R13	0698-3432	7		RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55=1/8-T0=26R1-F
A3R14	0698-3432	7		RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55=1/8-T0=26R1-F
A3R15	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A3R16	0757-0416	9		RESISTOR 619 1% .125W F TC=0+-100	24546	C4=1/8-T0=619R-F
A3R17	0757-0416	9		RESISTOR 619 1% .125W F TC=0+-100	24546	C4=1/8-T0=619R-F
A3R18	0698-3432	7		RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55=1/8-T0=26R1-F
A3R19	0698-3432	7		RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55=1/8-T0=26R1-F
A3R20	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4=1/8-T0=511R-F
A3R21	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4=1/8-T0=511R-F
A3R22	0698-3432	7		RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55=1/8-T0=26R1-F
A3R23	0757-0729	5		RESISTOR 681 1% .25W F TC=0+-100	24546	C5=1/4-T0=681R-F
A3R24	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A3R25	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A3R26	0757-0280	3	3	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A3R27	0757-0726	2		RESISTOR 511 1% .25W F TC=0+-100	24546	C5=1/4-T0=511R-F
A3R28	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A3R29	0757-0726	2		RESISTOR 511 1% .25W F TC=0+-100	24546	C5=1/4-T0=511R-F
A3R30	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A3R31	0757-0280	3	3	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A3R32	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A3R33	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A3R34	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4=1/8-T0=511R-F
A3R35	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4=1/8-T0=511R-F
A3R36	0698-3445	2	3	RESISTOR 348 1% .125W F TC=0+-100	24546	C4=1/8-T0=348R-F
A3R37	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4=1/8-T0=464R-F
A3R38	0757-0409	8		RESISTOR 274 1% .125W F TC=0+-100	24546	C4=1/8-T0=274R-F
A3R39	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4=1/8-T0=464R-F
A3R40	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4=1/8-T0=464R-F
A3R41	0757-0407	6	1	RESISTOR 200 1% .125W F TC=0+-100	24546	C4=1/8-T0=201-F
A3R42	0757-0399	5		RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4=1/8-T0=82R5-F
A3R43	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4=1/8-T0=215R-F
A3R44	0757-0408	7		RESISTOR 243 1% .125W F TC=0+-100	24546	C4=1/8-T0=243R-F
A3R45	0757-0178	8		RESISTOR 100 1% .25W F TC=0+-100	24546	C5=1/4-T0=101-F
A3R46	0757-0178	8	3	RESISTOR 100 1% .25W F TC=0+-100	24546	C5=1/4-T0=101-F
A3R47	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A3R48	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A3R49	0757-0409	8		RESISTOR 274 1% .125W F TC=0+-100	24546	C4=1/8-T0=274R-F
A3R50	0757-0178	8		RESISTOR 100 1% .25W F TC=0+-100	24546	C5=1/4-T0=101-F
A3R51	0684-0271	7	1	RESISTOR 2.7 10% .25W FC TC=400/+500	01121	CB27G1
A3R52	0684-0271	7		RESISTOR 2.7 10% .25W FC TC=400/+500	01121	CB27G1
A3R53	0684-0271	7		RESISTOR 2.7 10% .25W FC TC=400/+500	01121	CB27G1
A3R54	0699-0001	2		RESISTOR 2.7 10% .5W CC TC=0/+412	01121	EB27G1
A3R55	0757-0403	2		RESISTOR 121 1% .125W F TC=0+-100	24546	C4=1/8-T0=121R-F
A3R56	0757-0438	3	1	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4=1/8-T0=511R-F
A3R57	0698-3613	6		RESISTOR 39 5% 2W MO TC=0+-200	27167	FP42=2-T00=39R0-J

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3TP1	1251-2229	3		CONNECTOR=8GL CONT 8KT .033-IN-BSC-8Z	28480	1251-2229
A3TP16	1251-4045	5			28480	1251-4045
A3U1	1816-0909	0	8	IC TTL RAM 0-C	28480	1816-0909
A3U2	1816-0909	0		IC TTL RAM 0-C	28480	1816-0909
A3U3	1820-1475	6		IC CNTR TTL 8 BIN SYNCHRO POS-EDGE-TRIG	07263	93816DC
A3U4	1820-1475	6		IC CNTR TTL 8 BIN SYNCHRO POS-EDGE-TRIG	07263	93816DC
A3U5	1816-0909	0		IC TTL RAM 0-C	28480	1816-0909
A3U6	1816-0909	0		IC TTL RAM 0-C	28480	1816-0909
A3U7	1820-1475	6		IC CNTR TTL 8 BIN SYNCHRO POS-EDGE-TRIG	07263	93816DC
A3U8	1820-1475	6		IC CNTR TTL 8 BIN SYNCHRO POS-EDGE-TRIG	07263	93816DC
A3U9	1816-0909	0		IC TTL RAM 0-C	28480	1816-0909
A3U10	1816-0909	0		IC TTL RAM 0-C	28480	1816-0909
A3U11	1820-1475	6		IC CNTR TTL 8 BIN SYNCHRO POS-EDGE-TRIG	07263	93816DC
A3U12	1820-1475	6		IC CNTR TTL 8 BIN SYNCHRO POS-EDGE-TRIG	07263	93816DC
A3U13	1816-0909	0		IC TTL RAM 0-C	28480	1816-0909
A3U14	1816-0909	0		IC TTL RAM 0-C	28480	1816-0909
A3U15	1820-1475	6		IC CNTR TTL 8 BIN SYNCHRO POS-EDGE-TRIG	07263	93816DC
A3U16	1820-1475	6		IC CNTR TTL 8 BIN SYNCHRO POS-EDGE-TRIG	07263	93816DC
A3U17	1820-0693	8		IC FF TTL 8 D-TYPE POS-EDGE-TRIG	01295	8N74874N
A3U18	1820-0688	1	1	IC GATE TTL 8 NAND DUAL 4-INP	01295	8N74820N
A3U19	1820-0693	8		IC FF TTL 8 D-TYPE POS-EDGE-TRIG	01295	8N74874N
A3U20	1820-0693	8		IC FF TTL 8 D-TYPE POS-EDGE-TRIG	01295	8N74874N
A3U21	1820-0693	8		IC FF TTL 8 D-TYPE POS-EDGE-TRIG	01295	8N74874N
A3U22	1820-0693	8		IC FF TTL 8 D-TYPE POS-EDGE-TRIG	01295	8N74874N
A3U23	1820-0693	8		IC FF TTL 8 D-TYPE POS-EDGE-TRIG	01295	8N74874N
A3U24	1820-1158	2	5	IC GATE TTL 8 AND-OR-INV DUAL 2-INP	01295	8N74851N
A3U25	1820-1158	2		IC GATE TTL 8 AND-OR-INV DUAL 2-INP	01295	8N74851N
A3U26	1820-1158	2		IC GATE TTL 8 AND-OR-INV DUAL 2-INP	01295	8N74851N
A3U27	1820-0681	4		IC GATE TTL 8 NAND QUAD 2-INP	01295	8N74800N
A3U28	1820-1322	2		IC GATE TTL 8 NOR QUAD 2-INP	01295	8N74802N
A3U29	1820-1729	3	1	IC LCH TTL 8 COM CLEAR 8-BIT	01295	8N748259N
A3U30	1820-1322	2		IC GATE TTL 8 NOR QUAD 2-INP	01295	8N74802N
A3U31	1820-1198	0		IC GATE TTL 8 NAND QUAD 2-INP	01295	8N74803N
A3U32	1820-1198	0		IC GATE TTL 8 NAND QUAD 2-INP	01295	8N74803N
A3U33	1820-1192	4	4	IC SHF-RGTR TTL D-TYPE PRL-IN PRL-OUT	01295	8N74173N
A3U34	1820-1052	5		IC XLTR ECL ECL-TO-TTL QUAD 2-INP	04713	MC10125L
A3U35	1820-1197	9		IC GATE TTL 8 NAND QUAD 2-INP	01295	8N74800N
A3U36	1820-1414	3	2	IC GATE TTL 8 NAND TPL 3-INP	01295	8N74812N
A3U37	1820-1414	3		IC GATE TTL 8 NAND TPL 3-INP	01295	8N74812N
A3U38	1820-0269	4	10	IC GATE TTL NAND QUAD 2-INP	01295	8N7403N
A3U39	1820-0269	4		IC GATE TTL NAND QUAD 2-INP	01295	8N7403N
A3U40	1820-1192	4		IC SHF-RGTR TTL D-TYPE PRL-IN PRL-OUT	01295	8N74173N
A3U41	1820-1944	4	1	IC LCH ECL D-TYPE POS-EDGE-TRIG DUAL	04713	MC10130L
A3U42	1820-0691	8		IC GATE TTL 8 AND-OR-INV	01295	8N74864N
A3U43	1820-0685	8		IC GATE TTL 8 NAND TPL 3-INP	01295	8N74810N
A3U44	1820-0629	0	12	IC FF TTL 8 J-K NEG-EDGE-TRIG	01295	8N748112N
A3U45	1820-1411	0		IC LCH TTL 8 D-TYPE 4-BIT	01295	8N74875N
A3U46	1820-1475	6		IC CNTR TTL 8 BIN SYNCHRO POS-EDGE-TRIG	07263	93816DC
A3U47	1820-1192	4		IC SHF-RGTR TTL D-TYPE PRL-IN PRL-OUT	01295	8N74173N
A3U48	1820-1173	1		IC XLTR ECL TTL-TO-ECL QUAD 2-INP	04713	MC10124L
A3U49	1820-0685	8		IC GATE TTL 8 NAND TPL 3-INP	01295	8N74810N
A3U50	1820-0681	4		IC GATE TTL 8 NAND QUAD 2-INP	01295	8N74800N
A3U51	1820-1072	9	1	IC DCDR TTL 8 2-TO-4-LINE DUAL 2-INP	01295	8N748139N
A3U52	1820-0683	6	4	IC INV TTL 8 HEX 1-INP	01295	8N74804N
A3U53	1820-1411	0		IC LCH TTL 8 D-TYPE 4-BIT	01295	8N74875N
A3U54	1820-1475	6		IC CNTR TTL 8 BIN SYNCHRO POS-EDGE-TRIG	07263	93816DC
A3U55	1820-1192	4		IC SHF-RGTR TTL D-TYPE PRL-IN PRL-OUT	01295	8N74173N
A3U56	1820-1367	5		IC GATE TTL 8 AND QUAD 2-INP	01295	8N74808N
A3U57	1820-0686	9	3	IC GATE TTL 8 AND TPL 3-INP	01295	8N74811N
A3U58	1820-1158	2		IC GATE TTL 8 AND-OR-INV DUAL 2-INP	01295	8N74851N
A3U59	1820-1367	5		IC GATE TTL 8 AND QUAD 2-INP	01295	8N74808N
A3U60	1820-1116	2	1	IC FF TTL J-K BAR POS-EDGE-TRIG	01295	8N74109N
A3U61	1820-1475	6		IC CNTR TTL 8 BIN SYNCHRO POS-EDGE-TRIG	07263	93816DC
A3U62	1820-1475	6		IC CNTR TTL 8 BIN SYNCHRO POS-EDGE-TRIG	07263	93816DC
A3U63	1820-0683	6		IC INV TTL 8 HEX 1-INP	01295	8N74804N
A3U64	1820-0629	0		IC FF TTL 8 J-K NEG-EDGE-TRIG	01295	8N748112N
A3U65	1820-1158	2		IC GATE TTL 8 AND-OR-INV DUAL 2-INP	01295	8N74851N
A3U66	1820-0629	0		IC FF TTL 8 J-K NEG-EDGE-TRIG	01295	8N748112N
A3U67	1820-0683	6		IC INV TTL 8 HEX 1-INP	01295	8N74804N
A3U68	1820-0629	0		IC FF TTL 8 J-K NEG-EDGE-TRIG	01295	8N748112N
A3U69	1820-0704	2	1	IC MV TTL MONOSTBL RETRIG	01295	8N748122N
A3U70	1820-0629	0		IC FF TTL 8 J-K NEG-EDGE-TRIG	01295	8N748112N
A3U71	1820-0686	9		IC GATE TTL 8 AND TPL 3-INP	01295	8N74811N
A3U72	1820-0697	2	2	IC DRVR TTL 8 NAND LINE DUAL 4-INP	01295	8N748140N
A3U73	1820-0629	0		IC FF TTL 8 J-K NEG-EDGE-TRIG	01295	8N748112N
A3U74	1858-0055	5	3	TRANSISTOR ARRAY 14-PIN PL6TC DIP	04713	MPQ2369
A3U75	1820-0629	0		IC FF TTL 8 J-K NEG-EDGE-TRIG	01295	8N748112N

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3U76	1858-0055	5		TRANSISTOR ARRAY 14-PIN PLSTC DIP	04713	MPQ2369
A3U77	1858-0055	5		TRANSISTOR ARRAY 14-PIN PLSTC DIP	04713	MPQ2369
A3U78	1820-0629	0		IC FF TTL 8 J-K NEG-EDGE-TRIG	01295	8N748112N
A3U79	1820-0685	8		IC GATE TTL 8 NAND TPL 3-INP	01295	8N74810N
A3U80	1820-0681	4		IC GATE TTL 8 NAND QUAD 2-INP	01295	8N74800N
A3U81	1820-1205	0		IC GATE TTL L8 AND DUAL 4-INP	01295	8N74LS21N
A3U82	1820-1307	3	3	IC 8CHMITT-TRIG TTL 8 NAND QUAD 2-INP	01295	8N748132N
A3U83	1820-1307	3		IC 8CHMITT-TRIG TTL 8 NAND QUAD 2-INP	01295	8N748132N
A3U84	1820-1307	3		IC 8CHMITT-TRIG TTL 8 NAND QUAD 2-INP	01295	8N748132N
A3U85	1810-0290	0	2	NETWORK-RES 6-PIN-SIP .1-PIN-SPCG	28480	1810-0290
A3U86	1810-0290	0		NETWORK-RES 6-PIN-SIP .1-PIN-SPCG	28480	1810-0290
A3U87	1810-0076	0	1	NETWORK-RES 9-PIN-SIP .15-PIN-SPCG	28480	1810-0076
A3U88	1820-0697	2		IC DRVR TTL 8 NAND LINE DUAL 4-INP	01295	8N748140N
A3U89	1826-0004	7	2	IC 304 V RGLTR T0=100	07263	UA304HC
A3U90	1820-0685	8	8	IC GATE TTL 8 NAND TPL 3-INP	01295	SN74S10
A3XU1	1200-0663	8	8	SOCKET-IC 28-CONT DIP DIP-SLDR	28480	1200-0663
A3XU2	1200-0663	8		SOCKET-IC 28-CONT DIP DIP-SLDR	28480	1200-0663
A3XU3	1200-0663	8		SOCKET-IC 28-CONT DIP DIP-SLDR	28480	1200-0663
A3XU4	1200-0663	8		SOCKET-IC 28-CONT DIP DIP-SLDR	28480	1200-0663
A3XU5	1200-0663	8		SOCKET-IC 28-CONT DIP DIP-SLDR	28480	1200-0663
A3XU6	1200-0663	8		SOCKET-IC 28-CONT DIP DIP-SLDR	28480	1200-0663
A3XU7	1200-0607	0	20	SOCKET-IC 16-CONT DIP-SLDR	28480	1200-0607
A3XU9	1200-0663	8		SOCKET-IC 28-CONT DIP DIP-SLDR	28480	1200-0663
A3XU10	1200-0663	8		SOCKET-IC 28-CONT DIP DIP-SLDR	28480	1200-0663
A3XU11	1200-0607	0		SOCKET-IC 16-CONT DIP-SLDR	28480	1200-0607
A3XU12	1200-0663	8		SOCKET-IC 28-CONT DIP DIP-SLDR	28480	1200-0663
A3XU13	1200-0663	8		SOCKET-IC 28-CONT DIP DIP-SLDR	28480	1200-0663
A3XU14	1200-0663	8		SOCKET-IC 28-CONT DIP DIP-SLDR	28480	1200-0663
A3XU31				NOT ASSIGNED		
A3XU32				NOT ASSIGNED		
A3XU33				NOT ASSIGNED		
A3XU36				NOT ASSIGNED		
A3XU37				NOT ASSIGNED		
A3XU40				NOT ASSIGNED		
A3XU41	1200-0607	0		SOCKET-IC 16-CONT DIP-SLDR	28480	1200-0607
A3XU47				NOT ASSIGNED		
A3XU55				NOT ASSIGNED		
A3XU64	1200-0607	0		SOCKET-IC 16-CONT DIP-SLDR	28480	1200-0607
A3XU68	1200-0607	0		SOCKET-IC 16-CONT DIP-SLDR	28480	1200-0607
A3XU69	1200-0638	7	8	SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0638
A3XU72	1200-0638	7		SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0638
A3XU82	1200-0638	7		SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0638
A3XU83	1200-0638	7		SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0638
A3XU84	1200-0638	7		SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0638
A3XU88	1200-0638	7		SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0638
A5	01610-66505	4	2	DISPLAY CONTROL ASSEMBLY	28480	01610-66505
A5C1	0160-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A5C2	0160-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A5C3	0160-2201	7		CAPACITOR-FXD 51PF +-5% 300VDC MICA	28480	0160-2201
A5C4	0160-2202	8		CAPACITOR-FXD 75PF +-5% 300VDC MICA	28480	0160-2202
A5C5	0160-2202	8		CAPACITOR-FXD 75PF +-5% 300VDC MICA	28480	0160-2202
A5C6-						
A5C62	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A5CR1	1901-0045	6		DIODE-PWR RECT 100V 750MA DO-29	28480	1901-0045
A5CR2	1901-0045	6		DIODE-PWR RECT 100V 750MA DO-29	28480	1901-0045
A5CR3	1901-0045	6		DIODE-PWR RECT 100V 750MA DO-29	28480	1901-0045
A5CR4	1901-0045	6		DIODE-PWR RECT 100V 750MA DO-29	28480	1901-0045
A5CR5	1901-0045	6		DIODE-PWR RECT 100V 750MA DO-29	28480	1901-0045
A5CR6	1901-0045	6		DIODE-PWR RECT 100V 750MA DO-29	28480	1901-0045
A5CR7	1901-0045	6		DIODE-PWR RECT 100V 750MA DO-29	28480	1901-0045
A5CR8	1901-0045	6		DIODE-PWR RECT 100V 750MA DO-29	28480	1901-0045
A5CR9	1901-0535	9		DIODE-SCHOTTKY	28480	1901-0535
A5CR10	1901-0535	9		DIODE-SCHOTTKY	28480	1901-0535
A5CR11	1901-0535	9		DIODE-SCHOTTKY	28480	1901-0535
A5CR12	1901-0535	9		DIODE-SCHOTTKY	28480	1901-0535
A5CR13	1901-0535	9		DIODE-SCHOTTKY	28480	1901-0535
A5H1	2200-0103	2	36	SCREW-MACH 4-40 .25-IN-LG PAN-HD=POZI	00000	ORDER BY DESCRIPTION
A5MP1	01610-04701	2	1	SUPPORT, CIRCUIT BOARD	28480	01610-04701
A5R1	0684-1021	7	33	RESISTOR 1K 10% .25W FC TC=400/+600	01121	C81021
A5R2	0684-1021	7		RESISTOR 1K 10% .25W FC TC=400/+600	01121	C81021
A5R3	0684-1021	7		RESISTOR 1K 10% .25W FC TC=400/+600	01121	C81021
A5R4	0698-3443	0	3	RESISTOR 287 1% .125W F TC=0/+100	24546	C4=1/8-T0=287R-F
A5R5	0757-0414	5	1	RESISTOR 432 1% .125W F TC=0/+100	24546	C4=1/8-T0=432R-F
A5R6	0683-0685	5	2	RESISTOR 6.8 5% .25W FC TC=400/+500	01121	C86805
A5R7	0683-0685	5		RESISTOR 6.8 5% .25W FC TC=400/+500	01121	C86805
A5R8	0698-3447	4	3	RESISTOR 422 1% .125W F TC=0/+100	24546	C4=1/8-T0=422R-F
A5R9	0757-0418	9		RESISTOR 619 1% .125W F TC=0/+100	24546	C4=1/8-T0=619R-F
A5R10	0757-0419	0		RESISTOR 681 1% .125W F TC=0/+100	24546	C4=1/8-T0=681R-F

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
ASR11	0684-1021	7	1	RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
ASR12	0698-3132	4		RESISTOR 241 1% .125W F TC=0/+100	24546	CB4-1/8-T0=2610-F
ASR13	0757-0723	9		RESISTOR 365 1% .25W F TC=0/+100	24546	CB5-1/4-T0=365R-F
ASR14	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
ASR15	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
ASR16	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
ASR17	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
ASR18	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
ASR19	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
ASR20	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
ASR21	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
ASR22	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
ASR23	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
ASR24	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
ASR25	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
ASR26	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
ASR27	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
ASR28	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
ASR29	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
ASR30	0684-8201	9		RESISTOR 82 10% .25W FC TC=-400/+500	01121	CB8201
ASU1	1818-0156	3	8	IC NMOS 4K RAM DYN 470-NS 3-8	28480	1818-0156
ASU2	1818-0156	3		IC NMOS 4K RAM DYN 470-NS 3-8	28480	1818-0156
ASU3	1820-0762	2		IC MUXR/DATA=SEL TTL 2-T0-1-LINE QUAD	01295	8N74157N
ASU4	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	8N74LS04N
ASU5	1818-0156	3		IC NMOS 4K RAM DYN 470-NS 3-8	28480	1818-0156
ASU6	1818-0156	3		IC NMOS 4K RAM DYN 470-NS 3-8	28480	1818-0156
ASU7	1820-0762	2		IC MUXR/DATA=SEL TTL 2-T0-1-LINE QUAD	01295	8N74157N
ASU8	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	8N74LS04N
ASU9	1818-0156	3		IC NMOS 4K RAM DYN 470-NS 3-8	28480	1818-0156
ASU10	1818-0156	3		IC NMOS 4K RAM DYN 470-NS 3-8	28480	1818-0156
ASU11	1820-0762	2	2	IC MUXR/DATA=SEL TTL 2-T0-1-LINE QUAD	01295	8N74157N
ASU12	1820-1207	2		IC GATE TTL LS NAND 8-INP	01295	8N74LS30N
ASU13	1818-0156	3		IC NMOS 4K RAM DYN 470-NS 3-8	28480	1818-0156
ASU14	1818-0156	3		IC NMOS 4K RAM DYN 470-NS 3-8	28480	1818-0156
ASU15	1820-1432	5		IC CNTR TTL LS BIN SYNCHRO POS-EDGE-TRIG	01295	8N74LS163AN
ASU16	1820-1432	5	2	IC CNTR TTL LS BIN SYNCHRO POS-EDGE-TRIG	01295	8N74LS163AN
ASU17	1820-1297	0		IC GATE TTL LS EXCL-NOR QUAD 2-INP	01295	8N74LS266N
ASU18	1820-1297	0		IC GATE TTL LS EXCL-NOR QUAD 2-INP	01295	8N74LS266N
ASU19	1820-1810	3		IC DRVR TTL CLOCK DRVR	04713	MC3460P
ASU20	1820-1303	9		IC SHF-RGTR TTL S R-S PRL-IN PRL-OUT	01295	8N748195N
ASU21	1820-1303	9		IC SHF-RGTR TTL S R-S PRL-IN PRL-OUT	01295	8N748195N
ASU22	1820-1411	0		IC LCH TTL LS D-TYPE 4-BIT	01295	8N74LS75N
ASU23	1820-1411	0		IC LCH TTL LS D-TYPE 4-BIT	01295	8N74LS75N
ASU24	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	8N74LS04N
ASU25	1820-0269	4		IC GATE TTL NAND QUAD 2-INP	01295	8N7403N
ASU26	1820-0269	4		IC GATE TTL NAND QUAD 2-INP	01295	8N7403N
ASU27	1820-1411	0		IC LCH TTL LS D-TYPE 4-BIT	01295	8N74LS75N
ASU28	1820-1411	0		IC LCH TTL LS D-TYPE 4-BIT	01295	8N74LS75N
ASU29	1820-0762	6		IC GATE TTL NOR TPL 3-INP	01295	8N7427N
ASU30	1820-1432	5		IC CNTR TTL LS BIN SYNCHRO POS-EDGE-TRIG	01295	8N74LS163AN
ASU31	1818-0254	2	1	IC PMOS 3K ROM CHAR GEN STAT 600-NS 3-8	18324	2516N
ASU32	1820-1042	3		IC SHF-RGTR TTL R-S PRL-IN SERIAL-OUT	01295	8N74165N
ASU33	1820-1207	2		IC GATE TTL LS NAND 8-INP	01295	8N74LS30N
ASU34	1820-0685	8		IC GATE TTL S NAND TPL 3-INP	01295	8N74810N
ASU35	1820-0681	4		IC GATE TTL S NAND QUAD 2-INP	01295	8N74800N
ASU36	1820-0622	3	2	IC MUXR/DATA=SEL TTL 8-T0-1-LINE 8-INP	01295	8N74151AN
ASU37	1820-1204	9		IC GATE TTL LS NAND DUAL 4-INP	01295	8N74LS20N
ASU38	1820-1197	9		IC GATE TTL LS NAND QUAD 2-INP	01295	8N74LS00N
ASU39	1820-0629	0		IC FF TTL S J-K NEG-EDGE-TRIG	01295	8N748112N
ASU40	1820-2488	3		IC FF TTL LS D-TYPE POS EDGE-TRIG	01295	8N74ALS74
ASU41	1820-1478	9	3	IC CNTR TTL LS BIN ASYNCHRO	01295	8N74LS93N
ASU42	1820-1432	5		IC CNTR TTL LS BIN SYNCHRO POS-EDGE-TRIG	01295	8N74LS163AN
ASU43	1820-1432	5		IC CNTR TTL LS BIN SYNCHRO POS-EDGE-TRIG	01295	8N74LS163AN
ASU44	1820-1470	1		IC MUXR/DATA=SEL TTL LS 2-T0-1-LINE QUAD	01295	8N74LS157N
ASU45	1820-1441	6		IC ADDR TTL LS BIN FULL ADDR 4-BIT	01295	8N74LS283N
ASU46	1820-0629	0		IC FF TTL S J-K NEG-EDGE-TRIG	01295	8N748112N
ASU47	1820-1432	5		IC CNTR TTL LS BIN SYNCHRO POS-EDGE-TRIG	01295	8N74LS163AN
ASU48	1820-1432	5		IC CNTR TTL LS BIN SYNCHRO POS-EDGE-TRIG	01295	8N74LS163AN
ASU49	1820-1470	1		IC MUXR/DATA=SEL TTL LS 2-T0-1-LINE QUAD	01295	8N74LS157N
ASU50	1820-1441	6		IC ADDR TTL LS BIN FULL ADDR 4-BIT	01295	8N74LS283N
ASU51	1820-0629	0	3	IC FF TTL S J-K NEG-EDGE-TRIG	01295	8N748112N
ASU52	1820-0686	9		IC GATE TTL S AND TPL 3-INP	01295	8N74811N
ASU53	1820-1203	8		IC GATE TTL LS AND TPL 3-INP	01295	8N74LS11N
ASU54	1820-0174	0		IC INV TTL HEX	01295	8N7404N
ASU55	1820-1432	5		IC CNTR TTL LS BIN SYNCHRO POS-EDGE-TRIG	01295	8N74LS163AN

See introduction to this section for ordering information

*Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A5U56	1820-1282	3	1	IC FF TTL LS J-K BAR POS-EDGE-TRIG	01295	SN74LS109AN
A5U57	1820-1373	3		IC CNTR TTL S BCD SYNCHRO POS-EDGE-TRIG	07263	93S100C
A5U58	1820-0683	6		IC INV TTL S HEX 1-INP	01295	SN74804N
A5U59	1820-1203	8		IC GATE TTL LS AND TPL 3-INP	01295	SN74LS11N
A5U60	1820-0693	8		IC FF TTL S D-TYPE POS-EDGE-TRIG	01295	SN74874N
A5U61	1820-1432	5	1	IC CNTR TTL LS BIN SYNCHRO POS-EDGE-TRIG	01295	SN74LS163AN
A5U62	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A5U63	0410-1018	3		CRYSTAL-QUARTZ FREQ=20,000 MHZ +-0.01%	28480	0410-1018
A5U64	1820-1282	3		IC FF TTL LS J-K BAR POS-EDGE-TRIG	01295	SN74LS109AN
A5U65	1820-1201	8		IC GATE TTL LS AND QUAD 2-INP	01295	SN74LS08N
A5U66	1820-1203	6	8	IC GATE TTL LS AND TPL 3-INP	01295	SN74LS11N
A5U67	1820-1197	9		IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A5XU1	1200-0612	5		SOCKET-IC 22-CONT DIP-SLDR	02414	D1LB22P-108
A5XU2	1200-0612	5		SOCKET-IC 22-CONT DIP-SLDR	02414	D1LB22P-108
A5XU5	1200-0612	5		SOCKET-IC 22-CONT DIP-SLDR	02414	D1LB22P-108
A5XU6	1200-0612	5	5	SOCKET-IC 22-CONT DIP-SLDR	02414	D1LB22P-108
A5XU9	1200-0612	5		SOCKET-IC 22-CONT DIP-SLDR	02414	D1LB22P-108
A5XU10	1200-0612	5		SOCKET-IC 22-CONT DIP-SLDR	02414	D1LB22P-108
A5XU13	1200-0612	5		SOCKET-IC 22-CONT DIP-SLDR	02414	D1LB22P-108
A5XU14	1200-0612	5		SOCKET-IC 22-CONT DIP-SLDR	02414	D1LB22P-108
A5XU41	1200-0638	7	3	SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0638
A6	01610-66546	5		I/O MPU BOARD ASSEMBLY	28480	01610-66546
A6C1	0160-2150	9		CAPACITOR-FXD 33PF +-5% 300VDC MICA	28480	0160-2150
A6C2	0140-0192	9		CAPACITOR-FXD 68PF +-5% 300VDC MICA	72136	DM15E880J0300NV1CR
A6C3	0140-0192	5		CAPACITOR-FXD 68PF +-5% 300VDC MICA	72136	DM15E880J0300NV1CR
A6C4	0160-2150	9	8	CAPACITOR-FXD 33PF +-5% 300VDC MICA	28480	0160-2150
A6C5	0160-0174	5		CAPACITOR-FXD .47UF +-80-20% 25VDC CER	28480	0160-0174
A6C7	0160-2308	5		CAPACITOR-FXD 36PF +-5% 300VDC MICA	28480	0160-2308
A6C8	0180-0230	0		CAPACITOR-FXD .1UF +-20% 50VDC TA	56289	150D105X0050A2
A6C9	0160-3443	1		CAPACITOR-FXD .1UF +-80-20% 50VDC CER	28480	0160-3443
A6C11	0160-2055	9	2	CAPACITOR-FXD .01UF +-80-20% 100VDC CER	28480	0160-2055
A6C12	0160-0161	4		CAPACITOR-FXD .01UF +-10% 200VDC POLYE	28480	0160-0161
A6C13	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A6C14	0180-0373	2		CAPACITOR-FXD .68UF+-10% 35VDC TA	56289	150D684X9035A2
A6C17	0180-0301	6		CAPACITOR-FXD .5UF+-10% 50VDC AL	56289	30D505G0508B2
A6C19	0180-0301	6	2	CAPACITOR-FXD .5UF+-10% 50VDC AL	56289	30D505G0508B2
A6C20						
A6C44	0160-2055	9		CAPACITOR-FXD .01UF +-80-20% 100VDC CER	28480	0160-2055
A6C45	0160-2200	6		CAPACITOR-FXD 43PF +-5% 300VDC MICA	28480	0160-2200
A6C46	0180-0374	3		CAPACITOR-FXD 10UF +-10% 20VDC TA	56289	150D106X9020B2
A6C47				NOT USED		
A6CR1	1901-0040	1	1	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR5	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR6	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR7	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR8	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR9	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR10	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR11	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR12	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR13	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR14	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR15	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR16	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR17	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR18	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR19	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR20	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR21	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6M1	2200-0107	6	24	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A6J1	1251-4549	4	4	CONNECTOR 7-PIN M POST TYPE	28480	1251-4549
A6J2	1251-4546	1	1	CONNECTOR 8-PIN M POST TYPE	28480	1251-4546
A6J3	1251-4549	4		CONNECTOR 7-PIN M POST TYPE	28480	1251-4549
A6L1	9140-0112	2	1	COIL-MLD 4.7UH 10% Q=33 .155DX .375LG-NOM	28480	9140-0112
A6L2	9100-1633	0	1	COIL-MLD 68UH 5% Q=55 .155DX .375LG-NOM	28480	9100-1633
A6LS1	9160-0244	3	1	SPEAKER	28480	9140-0244
A6MP1	01610-01207	7	1	BRACKET, SPEAKER	28480	01610-01207
A6MP2	01610-01209	9	1	BRACKET, SPEAKER	28480	01610-01209
A601	1854-0246	8	3	TRANSISTOR NPN SI PD=350MW FT=250MHZ	04713	SP8 233
A602	1854-0472	2	1	TRANSISTOR NPN SI DARL PD=500MW	04713	MP8-A14
A603	1854-0246	8		TRANSISTOR NPN SI PD=350MW FT=250MHZ	04713	SP8 233
A6R1	0698-3155	1	30	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4=1/8-T0=4641-F
A6R2	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1002-F
A6R3	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1002-F
A6R4	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4=1/8-T0=4641-F
A6R5	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A6R6	0757-0280	3	3	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A6R7	0698-3430	5		RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0=21R5-F
A6R8	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4=1/8-T0=10R0-F
A6R9	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4=1/8-T0=10R0-F
A6R10	0698-3430	5		RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0=21R5-F

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6R11	0698-3446	3	1	RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A6R12	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6R13	0698-3157	3	2	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6R14	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6R15	0687-1001	9	1	RESISTOR 10 10% .5W CC TC=0+412	01121	EB1001
A6R16	0757-0466	7	1	RESISTOR 110K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1103-F
A6R17	0757-0389	3	1	RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A6R18	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6R21	0757-0279	0	1	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A6R22	0757-0290	5	3	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A6R23	0757-0460	1	1	RESISTOR 61.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A6R24	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A6R25	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A6R26	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6R27	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6R28	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A6R29	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A6R30	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6R31	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6R32	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6R33	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6R34	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6R35	0698-3428	1	1	RESISTOR 14.7 1% .125W F TC=0+-100	03688	PME55-1/8-T0-14R7-F
A6R36	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6R37	0757-0316	6	1	RESISTOR 42.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-42R2-F
A6R38	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6R39	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6R40	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6R41	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6R42	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6R43	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6R44	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6R45	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6TP1-						
A6TP14	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A6U1	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A6U2	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A6U3	1820-0471	0	2	IC INV TTL HEX 1-INP	01295	SN7406N
A6U4	1820-0471	0		IC INV TTL HEX 1-INP	01295	SN7406N
A6U5	1820-1197	9		IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A6U6	1820-1112	8	3	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74N
A6U7	1820-1112	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74N
A6U8	1820-1112	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74N
A6U9	1826-0205	0	1	IC TIMER TTL	18324	NE556A
A6U10	1820-0269	4		IC GATE TTL NAND QUAD 2-INP	01295	SN7403N
A6U11	1820-0269	4		IC GATE TTL NAND QUAD 2-INP	01295	SN7403N
A6U12	1820-1195	7	3	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS175N
A6U13	1820-1195	7		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS175N
A6U14	1820-1416	5	3	IC SCHMITT-TRIG TTL LS INV HEX 1-INP	01295	SN74LS14N
A6U15	1820-1217	4	1	IC MUX/DATA-BEL TTL LS 8-TO-1-LINE	01295	SN74LS151N
A6U16	1820-1216	3	2	IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A6U17	1818-0940	3		IC MASK ROM	28480	1818-0940
A6U18	1818-0942	5		IC MASK ROM	28480	1818-0942
A6U19	1818-0944	7		IC MASK ROM	28480	1818-0944
A6U20	1818-0946	9		IC MASK ROM	28480	1818-0946
A6U21	1818-0941	4	1	IC MASK ROM	28480	1818-0941
A6U22	1818-0943	6		IC MASK ROM	28480	1818-0943
A6U23	1818-0945	8		IC MASK ROM	28480	1818-0945
A6U24	1818-0947	0		IC MASK ROM	28480	1818-0947
A6U25	1820-1804	5	1	IC BFR NMOS CLOCK DRV	04713	MPQ6842
A6U26	1820-1480	3	1	IC MICPROC NMOS 8-BIT	04713	MC6800L
A6U27	1820-0629	0		IC FF TTL S J-K NEG-EDGE-TRIG	01295	SN748112N
A6U28	1820-1416	5		IC SCHMITT-TRIG TTL LS INV HEX 1-INP	01295	SN74LS14N
A6U29	1820-0175	1	3	IC INV TTL HEX 1-INP	01295	SN7405N
A6U30	1820-0175	1		IC INV TTL HEX 1-INP	01295	SN7405N
A6U31	1820-0175	1		IC INV TTL HEX 1-INP	01295	SN7405N
A6U32	1820-1081	0	2	IC DRV R TTL BUS DRV QUAD 1-INP	04713	MC8T26AP
A6U33	1820-1081	0		IC DRV R TTL BUS DRV QUAD 1-INP	04713	MC8T26AP
A6U34	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A6U35	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A6U36	1820-1130	0		IC GATE TTL S NAND 13-INP	01295	SN748133N
A6U37	1820-1216	3		IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A6U38	1820-0269	4		IC GATE TTL NAND QUAD 2-INP	01295	SN7403N
A6U39	1820-0269	4		IC GATE TTL NAND QUAD 2-INP	01295	SN7403N
A6U40	1820-1942	2	1	IC CNTR TTL S 8IN SYNCHRO POS-EDGE-TRIG	01295	SN748163J

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6U41	1820-0685	8	1	IC GATE TTL S NAND TPL 3-INP	01295	SN74S10N
A6U42	1820-0681	4		IC GATE TTL S NAND QUAD 2-INP	01295	SN74S00N
A6U43	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A6U44	1820-0328	6		IC GATE TTL NOR QUAD 2-INP	01295	SN7402N
A6U45	1820-1197	9		IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A6U46	1820-0269	4	1	IC GATE TTL NAND QUAD 2-INP	01295	SN7403N
A6U47	1810-0307	0		NETWORK-CNDCT MODULE DIP; 16 PINS; 0.100	28480	1810-0307
A6U48	1820-1144	6		IC GATE TTL LS QUAD 2-IN NOR	01295	SN74LS02
A6XU9	1200-0638	7		SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0638
A6XU17	1200-0541	1		SOCKET-IC 24-CONT DIP DIP-SLDR	28480	1200-0541
A6XU18	1200-0541	1	1	SOCKET-IC 24-CONT DIP DIP-SLDR	28480	1200-0541
A6XU19	1200-0541	1		SOCKET-IC 24-CONT DIP DIP-SLDR	28480	1200-0541
A6XU20	1200-0541	1		SOCKET-IC 24-CONT DIP DIP-SLDR	28480	1200-0541
A6XU21	1200-0541	1		SOCKET-IC 24-CONT DIP DIP-SLDR	28480	1200-0541
A6XU22	1200-0541	1		SOCKET-IC 24-CONT DIP DIP-SLDR	28480	1200-0541
A6XU23	1200-0541	1	1	SOCKET-IC 24-CONT DIP DIP-SLDR	28480	1200-0541
A6XU24	1200-0541	1		SOCKET-IC 24-CONT DIP DIP-SLDR	28480	1200-0541
A6XU26	1200-0654	7		SOCKET-IC 40-CONT DIP-SLDR	28480	1200-0654
A6XU32	1200-0607	0	1	SOCKET-IC 16-CONT DIP DIP-SLDR	28480	1200-0607
A6XU33	1200-0607	0		SOCKET-IC 16-CONT DIP DIP-SLDR	28480	1200-0607
A6XU47 TEST	1200-0607	0		SOCKET-IC 16-CONT DIP-SLDR	28480	1200-0607
A6XU47 NORMAL	1200-0607	0		SOCKET-IC 16-CONT DIP-SLDR	28480	1200-0607
A9	01610-66545	8	2	DISPLAY/DRIVER ASSEMBLY	28480	01610-66545
A9C1	0160-3622	8	11	CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C2	0180-0106	9		CAPACITOR-FXD 60UF ±20% 6VDC TA	56289	150D606X0006B2
A9C3	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C4	0180-0141	2		CAPACITOR-FXD 50UF +75-10% 50VDC AL	56289	30D506G0DD2
A9C5	0180-0058	0		CAPACITOR-FXD 50UF+75-10% 25VDC AL	56289	30D506G025CC2
A9C6	0180-0141	2	2	CAPACITOR-FXD 50UF+75-10% 50VDC AL	56289	30D506G050DD2
A9C7	0180-0374	3		CAPACITOR-FXD 10UF +10% 200VDC TA	56289	150D106X9020B2
A9C8	0160-3456	6		CAPACITOR-FXD 1000PF ±10% 1KVDC CER	72982	0838(1KV) X5E0-0471K
A9C9	0180-0141	2		CAPACITOR-FXD 50UF +75-10% 50VDC AL	56289	30D506G0DD2
A9C10	0160-4455	7		CAPACITOR-FXD 10UF ±10% 50VDC MET-POLYC	28480	0160-4455
A9C11	0160-2218	6	3	CAPACITOR-FXD 1000PF +5% 300VDC MICA	28480	0160-2218
A9C12	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A9C13	0160-4609	3		CAPACITOR-FXD 4700PF +5% 1KVDC CER	28480	0160-4609
A9C14	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A9C15	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C16	0160-2218	6	6	CAPACITOR-FXD 1000PF +5% 300VDC MICA	28480	0160-2218
A9C17	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C18	0160-4455	7		CAPACITOR-FXD 10UF ±10% 50VDC MET-POLYC	28480	0160-4455
A9C19	0160-4455	7		CAPACITOR-FXD 10UF ±10% 50VDC MET-POLYC	28480	0160-4455
A9C20	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C21	0160-2218	6	2	CAPACITOR-FXD 1000PF +5% 300VDC MICA	28480	0160-2218
A9C22	0160-3494	2		CAPACITOR-FXD .47UF ±5% 200VDC	28480	0160-3494
A9C23	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C24	0180-0059	1		CAPACITOR-FXD 10UF+75-10% 25VDC AL	56289	30D106G025BB2
A9C25	0140-0159	8		CAPACITOR-FXD 3000PF +2% 300VDC MICA	72136	DM19F302G0300MV1CR
A9C26	0180-0058	0	6	CAPACITOR-FXD 50UF+75-10% 25VDC AL	56289	30D506G025CC2
A9C27	0160-3456	6		CAPACITOR-FXD 1000PF +10% 1KVDC CER	72982	0838(1KV) X5E0-0471K
A9C28	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A9C29	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C30	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A9C31	0160-0174	9	1	CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A9C32	0180-2210	0		CAPACITOR-FXD 2UF+50-10% 150VDC AL	56289	30D205F150BB2
A9C33	0160 2897	7		CAPACITOR-FXD .02UF +80-20% 600VDC CER	72982	841-532-25U-203Z
A9C34	0160 2897	7		CAPACITOR-FXD .02UF +80-20% 600VDC CER	72982	841-532-25U-203Z
A9C35	0160-4230	6		CAPACITOR-FXD .01UF +80-20% 1KVDC CER	71590	GAP=103
A9C36	0160-4230	6	1	CAPACITOR-FXD .01UF +80-20% 1KVDC CER	71590	GAP=103
A9C37	0160-4230	6		CAPACITOR-FXD .01UF +80-20% 1KVDC CER	71590	GAP=103
A9C38	0180-0059	1		CAPACITOR-FXD 10UF+75-10% 25VDC AL	56289	30D106G025BB2
A9C39	0180-0059	1		CAPACITOR-FXD 10UF+75-10% 25VDC AL	56289	30D106G025BB2
A9C40	0160-4455	7		CAPACITOR-FXD 10UF ±10% 50VDC MET-POLYC	28480	0160-4455
A9C41				NOT ASSIGNED		
A9C42	0160-3622	8	1	CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C43	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C44	0160-3455	5		CAPACITOR-FXD 470PF ±10% 1KVDC CER	56289	C016F102F471KS22
A9C45	0180-0106	9		CAPACITOR-FXD 60UF+20% 6VDC TA	56289	150D606X0006B2
A9C46	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C47	0160-3622	8	1	CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C48	0170-0022	7		CAPACITOR-FXD 1UF ±20% 600VDC POLYSTY	56289	490P103B6 PYF
A9C49	0150-0012	3		CAPACITOR-FXD 01UF ±20% 1KVDC CER	56289	G023A102J103MS38 CDH
A9CR1	1901-0050	3	3	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A9CR2	1901-0787	3	2	DIODE-PWR RECT 600V 6A	04713	MR756
A9CR3	1901-0896	5	2	DIODE-FAST RECOVERY RECT. 600V 1A 250 NS	83701	RC-60
A9CR4	1901-0490	5	1	DIODE-MV RECT 3KV 250MA	28480	1901-0490
A9CR5	1901-0896	5		DIODE-FAST RECOVERY RECT 600V 1A 250 NS	83701	RC-60

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A9CR6	1901-0050	3	3	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A9CR7	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A9CR8	1901-0787	3		DIODE-PWR RECT 600V 6A	04713	MR756
A9CR9	1901-0028	5	8	DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A9CR10	1901-0030	9	1	DIODE-PWR RECT 800V 600MA DO-29	04713	SR1358-11
A9D81	2140-0013	5	1	LAMP-GLOW 5AB-A 70/57VDC 300UA T-2-BULB	00466	5AB(NE-23)
A9E1	0340-0614	4	18	INSULATOR-X8TR ALUMINUM HD-ANDZ	28480	0340-0614
A9H1	2360-0121	2	6	SCREW-MACH 6-32 .5-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A9H2	2360-0203	1	5	SCREW-MACH 6-32 .625-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A9H3	2420-0002	6	1	NUT-HEX=OBL=CHAM 6-32=THD .109-IN=THK	28480	2420-0002
A9H4	2190-0909	3	9	WASHER-LK INTL T NO. 6 .146-IN-ID	28480	2190-0909
A9H5	0380-0342	9	4	STANDOFF-RVT=ON .125-IN-LG 6-32THD	00000	ORDER BY DESCRIPTION
A9J1	1251-4715	9		CONNECTOR 17-PIN M POST TYPE	28480	1251-4715
A9L1	9100-3139	5	3	COIL 75UH 15% .5DX.875LG=NDM	28480	9100-3139
A9L2	9140-0111	1	1	COIL=MLD 3.3UH 10% Q#33 .155DX.375LG=NDM	28480	9140-0111
A9L3	9100-3139	5		COIL 75UH 15% .5DX.875LG=NDM	28480	9100-3139
A9L4	9100-3931	5	2	COIL 700UH .6DX1.437LG=NDM	28480	9100-3931
A9L5	9100-3931	5		COIL 700UH .6DX1.437LG=NDM	28480	9100-3931
A9L6	9100-3139	5		COIL 75UH 15% .5DX.875LG=NDM	28480	9100-3139
A9MP1	1205-0320	4	1		28480	1205-0320
A9MP2	1205-0242	9	1	HEAT SINK SGL TO-3=C8	28480	1205-0242
A9MP3	1205-0258	7	2	THERMAL LINK PLSTC=PWR=PKG	28480	1205-0258
A9MP4	7120-6264	3	2	LABEL, WARNING	28480	7120-6264
A9MP5	1400-0249	0	5	.062-.625-DIA .091-WD NYL	06383	PLTIM-MP8
A9MP6	1400-0153	5	1	.062-1.75-DIA .19WD NYL	17612	V1301
A9Q1	1854-0624	6	1	TRANSISTOR NPN 2N6308 SI TO-3 PD=125W	04713	2N6308
A9Q2	1854-0778	1	1	TRANSISTOR NPN SI TO-3	28480	1854-0778
A9Q3	1853-0334	3	2	TRANSISTOR PNP SI DARL PD=70W FT=1MHZ	04713	MJE1090
A9Q4	1854-0215	1	10	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A9Q5	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A9Q6	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A9Q7	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A9Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A9Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A9Q10	1853-0086	2	1	TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A9Q11	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A9Q12	1854-0691	7	1	TRANSISTOR NPN SI TO-92 PD=350MW	04713	MPS A18
A9Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A9Q14	1854-0320	9	1	TRANSISTOR NPN SI PD=83.5W FT=4MHZ	28480	1854-0320
A9Q15	1853-0251	3	1	TRANSISTOR PNP SI PD=90W FT=2MHZ	28480	1853-0251
A9R1	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A9R2	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A9R3	0757-0401	0	11	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A9R4	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	64-1/8-T0-511R-F
A9R5	2100-3351	6	2	RESISTOR-TRMR 500 10% C SIDE=ADJ 1-TRN	28480	2100-3351
A9R6	0757-0408	7		RESISTOR 243 1% .125W F TC=0+-100	24546	C4-1/8-T0-243R-F
A9R7	2100-3351	6		RESISTOR-TRMR 500 10% C SIDE=ADJ 1-TRN	28480	2100-3351
A9R8	0757-0284	7	9	RESISTOR 150 1% .125W F TC=0+-100	24546	C4-1/8-T0-151-F
A9R9	0757-0408	7		RESISTOR 243 1% .125W F TC=0+-100	24546	C4-1/8-T0-243R-F
A9R10	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A9R11	0757-0446	3	5	RESISTOR 15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1502-F
A9R12	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A9R13	0686-1015	3	1	RESISTOR 100 5% .5W CC TC=0+-529	01121	EB1015
A9R14	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A9R15	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A9R16	0698-3484	9	1	RESISTOR 6.65K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6651-F
A9R17	0811-3424	9	1	RESISTOR .5 1% 3W PW TC=0+-90	11502	PW10
A9R18	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	64-1/8-T0-511R-F
A9R19	0698-3449	6	2	RESISTOR 28.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2872-F
A9R20	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A9R21	0757-0290	5		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C118-T0 6191-F
A9R22	0757-0317	7	1	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A9R23	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A9R24	0757-0446	3		RESISTOR 15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1502-F
A9R25	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A9R26	0757-0445	2	1	RESISTOR 13K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1302-F
A9R27	2100-3207	1	2	RESISTOR-TRMR 5K 10% C SIDE=ADJ 1-TRN	28480	2100-3207
A9R28	0757-0444	1	4	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A9R29	0757-0458	7	6	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A9R30	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A9R31	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A9R32	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A9R33	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A9R34	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A9R35	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F

See introduction to this section for ordering information

*Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A9R36	0757-0407	6	1	RESISTOR 200 1% .125W F TC=0+-100	24546	C4=1/8-T0=201-F
A9R37	0811-1674	7		RESISTOR 4.7 5% 2W PW TC=0+-400	75042	BWM2-4R7-J
A9R38	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	64-1/8-T0-511R-F
A9R39	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1213-F
A9R40	0757-0430	5		RESISTOR 2.21K 1% .125W F TC=0+-100	24546	C4=1/8-T0=2211-F
A9R41	0698-3510	3	2	RESISTOR 453 1% .125W F TC=0+-100	24546	C4=1/8-T0=751-F
A9R42	2100-3351	7		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A9R43	0698-7401	6		RESISTOR 1.71K .25% .125W F TC=±25	07716	CEA-993
A9R44	0757-0273	4		RESISTOR 3.01K 1% .125W F TC=0+-100	24546	C4=1/8-T0=3011-F
A9R45	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4=1/8-T0=201-F
A9R46	0757-0452	1	1	RESISTOR 27.4K 1% .125W F TC=0+-100	07716	CEAT-0
A9R47	0698-6426	5		RESISTOR 213K 1% .125W F TC=0+-100	28480	0698-6426
A9R48	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1002-F
A9R49	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1002-F
A9R50	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4=1/8-T0=101-F
A9R51	0757-0401	0	1	RESISTOR-TRMR 100K 10% C SIDE-ADJ 1-TRN	28480	2100-3355
A9R52	2100-3355	0		RESISTOR 243K 1% .125W F TC=0+-100	24546	C4=1/8-T0=2433-F
A9R53	0757-0474	7		RESISTOR 909K 1% .125W F TC=0+-100	07716	CEA-993
A9R54	0698-8961	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1002-F
A9R55	0757-0442	7		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1212-F
A9R56	0757-0444	1	2	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4=1/8-T0=5111-F
A9R57	0757-0438	3		RESISTOR 6.8K 2% .125W F TC=0+-100	24546	C4=1/8-T0=6801-G
A9R58	0757-0944	6		RESISTOR 6.8K 2% .125W F TC=0+-100	24546	C4=1/8-T0=6801-G
A9R59	0757-0944	6		RESISTOR 6.8K 2% .125W F TC=0+-100	24546	C4=1/8-T0=6801-G
A9R60	0812-0066	1		RESISTOR .33 5% 2W PW TC=0+-800	75042	BWM2-33/100-J
A9R61	0812-0066	1	2	RESISTOR .33 5% 2W PW TC=0+-800	75042	BWM2-33/100-J
A9R62	0757-0198	2		RESISTOR 100 1% .5W F TC=0+-100	28480	0757-0198
A9R63	0812-0045	6		RESISTOR .15 5% 3W PW TC=0+-90	28480	0812-0045
A9R64	0757-0198	2		RESISTOR 100 1% .5W F TC=0+-100	28480	0757-0198
A9R65	0683-5105	4		RESISTOR 51 5% .25W FC TC=-400/+500	01121	CB5105
A9R66	0687-5601	3	1	RESISTOR 56 10% .5W CC TC=0+412	01121	EB5601
A9R67	0683-5105	4		RESISTOR 51 5% .25W FC TC=-400/+500	01121	CB5105
A9R68	0686-5115	2		RESISTOR 510 5% .5W CC TC=0+529	01121	EB5115
A9R69	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A9R70	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A9R71	2100-3358	3	2	RESISTOR-TRMR 1M 20% C SIDE-ADJ 1-TRN	28480	2100-3358
A9R72	2100-3358	3		RESISTOR-TRMR 1M 20% C SIDE-ADJ 1-TRN	28480	2100-3358
A9R73	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A9R74	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+800	01121	CB1021
A9R75	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+800	01121	CB1021
A9R76	0684-1021	7	1	RESISTOR 1K 10% .25W FC TC=-400/+800	01121	CB1021
A9R77	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4=1/8-T0=101-F
A9R78	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4=1/8-T0=101-F
A9R79	0760-0014	8		RESISTOR 1K 2% 1W MO TC=0+-200	28480	0760-0014
A9R80	2100-3207	1		RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A9R81	0757-0280	3	3	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A9R82	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1002-F
A9R83	0698-0093	0		RESISTOR 10 5% 1W MO TC=0+-200	28480	0698-0093
A9R84	0698-6755	3		RESISTOR 8K 5% .125W F TC=0±50	24546	NC55-1/8-T2-8001-D
A9R85	0687-1051	9		RESISTOR 1M 10% .5W CC TC=0+100	01121	EB1051
A9T1	5061-1228	1	1	TRANSFORMER, DRIVE	28480	5061-1228
A9TP1	0360-0535	0	0	TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A9TP2	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A9TP3	1251-2229	3	0	CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	28480	1251-2229
A9TP4	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A9TP5	0360 0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A9TP6	1251 4045	5		SOCKET-GROUND	28480	1251-4045
A9U1	1820-0196	6	1	IC 723 V RGLTR T0=100	04713	MC1723CG
A9U2	1820-0261	6		IC MV TTL MONOSTBL	01295	8N74121N
A9U3	1820-1796	4		IC DRVr TTL DUAL 2-INP	27014	083611N
A9U4	1820-1416	5		IC 8CMHITT-TRIG TTL LS INV HEX 1-INP	01295	8N74LS14N
A9U5	1820-0668	7		IC BFR TTL NON-INV HEX 1-INP	01295	8N7407N
A9U6	1826-0254	9	2	OP AMP GP 8-DIP-P	04713	MC17418CP1
A9U7	1826-0254	9		OP AMP GP 8-DIP-P	04713	MC17418CP1
A9VR1	1902-0593	1	6	DIODE-ZNR 43.2V 10% DO=15 PD=1W TC=+.08%	28480	1902-0593
A9VR2	1902-0668	1		DIODE-ZNR 200V 5% DO=15 PD=1W TC=+.08%	28480	1902-0668
A9VR3	1902-0668	1		DIODE-ZNR 200V 5% DO=15 PD=1W TC=+.08%	28480	1902-0668
A9VR4	1902-0668	1		DIODE-ZNR 200V 5% DO=15 PD=1W TC=+.08%	28480	1902-0668
A9VR5	1902-0041	4		DIODE-ZNR 5.11V 5% DO=7 PD=.4W TC=-.009%	28480	1902-0041
A9VR6	1902-0041	4	1	DIODE-ZNR 5.11V 5% DO=7 PD=.4W TC=-.009%	28480	1902-0041
A9VR7	1902-0668	1		DIODE-ZNR 200V 5% DO=15 PD=1W TC=+.08%	28480	1902-0668
A9VR8	1902-0668	1		DIODE-ZNR 200V 5% DO=15 PD=1W TC=+.08%	28480	1902-0668
A9VR9	1902-0668	1		DIODE-ZNR 200V 5% DO=15 PD=1W TC=+.08%	28480	1902-0668
A9VR10	1902-0026	5		DIODE-ZNR 36.5V 10% DO=7 PD=.4W	28480	1902-0026

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A9VR11	1902-0041	4		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	28480	1902-0041
A9VR12	1902-0041	4		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	28480	1902-0041
A10	01610-66549	6	1	POWER SUPPLY BOARD ASSEMBLY	28480	01610-66549
A10C1	0160-2903	6	1	CAPACITOR-FXD .05UF +-20% 50VDC CER	28480	0160-2903
A10C2	0160-2758	1	1	CAPACITOR-FXD 850UF+75-10% 100VDC AL	28480	0160-2758
A10C3	0160-3448	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3448
A10C4	0160-0058	0		CAPACITOR-FXD 50UF+75-10% 25VDC AL	56289	30D506G025CC2
A10C5	0160-0091	1		CAPACITOR-FXD 10UF+50-10% 100VDC AL	56289	30D106F100DC2
A10C6	0160-3460	2	2	CAPACITOR-FXD .05UF +80-20% 100VDC CER	28480	0160-3460
A10C7	0160-0542	7	2	CAPACITOR-FXD 4400UF+75-10% 30VDC AL	00853	500442U030AA2B
A10C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A10C9	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A10C10	0160-3448	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3448
A10C11	0160-0094	4	2	CAPACITOR-FXD 100UF+75-10% 25VDC AL	56289	30D107G025DD2
A10C12	0160-0106	9		CAPACITOR-FXD 60UF+-20% 6VDC TA	56289	150D606X0006B2
A10C13	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A10C14	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A10C15	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A10C16	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A10C17	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A10C18	0160-3443	1		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-3443
A10C19	0160-3447	5		CAPACITOR-FXD 470PF +-10% 1KVDC CER	28480	0160-3447
A10C20	0160-3460	2		CAPACITOR-FXD .05UF +80-20% 100VDC CER	28480	0160-3460
A10C21	0160-0542	7		CAPACITOR-FXD 4400UF+75-10% 30VDC AL	00853	500442U030AA2B
A10C22	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A10C23	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A10C24	0160-0094	4		CAPACITOR-FXD 100UF+75-10% 25VDC AL	56289	30D107G025DD2-DSM
A10C25	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A10C26	0160-3448	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3448
A10C27	0160-0094	4		CAPACITOR-FXD 100UF+75-10% 25VDC AL	56289	30D107G025DD2
A10C28	0160-3448	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3448
A10C29	0160-1746	5	1	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A10C30	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A10C31	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A10C32	0160-3448	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3448
A10C33	0160-3448	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3448
A10CR1	1901-0638	3	3	DIODE-FW BRDG 100V 4A	04713	MDA-970-2
A10CR2	1906-0772	1		DIODE-FW BRDG 400V 25A	04713	MDA2504
A10CR3	1901-0638	1		DIODE-FW BRDG 100V 4A	04713	MDA-970-2
A10CR4	1901-0028	9		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A10CR5	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A10CR6	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A10CR7	1901-0028	5		DIODE-PWR RECT 400V 75MA DO-29	28480	1901-0028
A10CR8	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A10CR9	1901-0040	1	6	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A10CR10	1901-0028	5		DIODE-PWR RECT 400V 75MA DO-29	28480	1901-0028
A10CR11	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A10CR12	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A10CR13	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A10CR14	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A10CR1	1900-0486	6	1	LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4684
A10F1	2110-0002	9	1	FUSE 2A 250V FAST-BLO 1.25X.25 UL	75915	312002
A10F2	2110-0001	8	1	FUSE 1A 250V FAST-BLO 1.25X.25 UL	75915	312001
A10F3	2110-0010	9	1	FUSE 5A 250V NTD 1.25X.25 UL	75915	312005
A10F4	2110-0055	2	1	FUSE 4A 250V NTD 1.25X.25 UL	75915	312004
A10H1	2680-0099	1	6	SCREW-MACH 10-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A10H2	2190-0011	8	6	WASHER-LK INTL T No.10 .195-IN-ID	28480	2190-0011
A10H3	2510-0109	5		SCREW-MACH 8-32 .625-IN-LG PAB-HD-POZI	28480	2510-0109
A10H4	2190-0017	4		WASHER-LK HL CL No.8 168-IN-ID	28480	2190-0017
A10H5	2360-0121	2		SCREW-MACH 6-32 .5-IN-LG PAN-HD-POZI	28480	2360-0121
A10H6	2420-0001	5		NUT-HEX-W/LKWR 6-32-THD .109-IN-THK	28480	2420-0001
A10J1	1251-3276	2	1	CONNECTOR 6-PIN M POST TYPE	28480	1251-3276
A10MP1	2110-0269	0	10	FUSEHOLDER-CLIP TYPE,25D-FUSE	28480	2110-0269
A10MP2				NOT ASSIGNED		
A10MP3				NOT ASSIGNED		
A10MP4	1205-0338	4	1	HEAT SINK SGL PLSTC-PWR-CS	28480	1205-0338
A10Q1	1854-0330	1	2	TRANSISTOR NPN 8I PD=21W FT=10MHZ	28480	1854-0330
A10Q2	18A4-0082	3	2	THYRISTOR-SCR 2N4441 VRRM=50	04713	2N4441
A10Q3	18A4-0074	3	1	THYRISTOR-SCR 2N5060 TO=92 VRRM=30	04713	2N5060
A10Q4	18A4-0082	3		THYRISTOR-SCR 2N4441 VRRM=50	04713	2N4441
A10R1	0698-3338	2	1	RESISTOR 1.5K 5% 2W MO TC=0+-200	28480	0698-3338
A10R2	0757-0446	3		RESISTOR 15K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1502-F
A10R3	0761-0057	1	1	RESISTOR 560 5% 1W MO TC=0+-200	28480	0761-0057
A10R4	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1002-F
A10R5	0698-3158	4	2	RESISTOR 23.7K 1% .125W F TC=0+-100	24546	C4=1/8-T0-2372-F
A10R6	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4=1/8-T0-511R-F
A10R7	0698-3161	9	1	RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4=1/8-T0-3832-F
A10R8	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4=1/8-T0-10R0-F
A10R9	2100-3353	8	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	32997	3366X-Y46-203
A10R10	0698-3449	6		RESISTOR 28.7K 1% .125W F TC=0+-100	24546	C4=1/8-T0-2872-F

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10R11	0757-0824	1	1	RESISTOR 2K 1% .5W F TC=0+-100	28480	0757-0824
A10R12	0757-0839	8	1	RESISTOR 10K 1% .5W F TC=0+-100	28480	0757-0839
A10R13	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10R14	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10R15	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10R16	0757-0283	6	2	RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A10R17	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A10R18	0811-0929	3		RESISTOR .51 5% 2W PW TC=0+-800	75042	BWH2-R51-J
A10R19	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A10R20	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10R21	0698-0085	0	2	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A10R22	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10R23	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A10R24	0757-0436	1	2	RESISTOR 4.32K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4321-F
A10R25	0698-8028	7	1	RESISTOR 800 1% .125W F TC=0+-100	19701	MF4C1/8-T0-800R-F
A10R26	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A10R27	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10R28	0757-0436	1		RESISTOR 4.32K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4321-F
A10R29	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10R30	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10R31	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10R32	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10R33	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10R34	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10R35	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10R36	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10R37	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A10R38	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A10R39	0698-7832	9		RESISTOR 909K 1% .125W F TC=0+-100	28480	0698-7832
A10R40	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10R41	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10R42	0757-0932	2	1	RESISTOR 2.2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2201-G
A10R43	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10R44	0698-7832	9		RESISTOR 909K 1% .125W F TC=0+-100	28480	0698-7832
A10R45	0757-0820	7	1	RESISTOR 1.1K 1% .5W F TC=0+-100	28480	0757-0820
A10R46	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10R47	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10R48	2100-3273	1	1	RESISTOR-TRMR 2K 10% C SIDE=ADJ 1-TRN	28480	2100-3273
A10R49	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10R50	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10R51				NH1 ASSIGNED		
A10R52	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10R53	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A10R54	0811-1553	1		RESISTOR .68 5% 2W PW TC=0+-800	75042	BWH2-11/16-J
A10R55	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A10R56	0757-1094	9		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A10R57	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10R58	0757-0440	7	2	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A10R59	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10R60	0757-0436	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10R61	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10R62	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10R63	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10R64	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10R65	0811-1668	9	1	RESISTOR 1.5 5% 2W PW TC=0+-400	75042	BWH2-1R5-J
A10R66	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10R67	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A10R68	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10R69	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10R70	0811-0929	3		RESISTOR .51 5% 2W PW TC=0+-800	75042	BWH2-R51-J
A10R71	0811-1553	1		RESISTOR .68 5% 2W PW TC=0+-800	75042	BWH2-11/16-J
A10TP1	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A10TP2	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A10TP3	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A10TP4	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A10TP5	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A10TP6	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A10TP7	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A10U1	1826-0065	0		COMPARATOR PRCN 8-DIP-P	01295	8N72311P
A10U2	1820-0439	0	3	IC V RGLTR 14-DIP-P	07263	723PC
A10U3	1820-0439	0		IC V RGLTR 14-DIP-P	07263	723PC
A10U4	1820-0439	0		IC V RGLTR 14-DIP-P	07263	723PC
A10U5	1826-0065	0		COMPARATOR PRCN 8-DIP-P	01295	8N72311P
A10U6	1820-1212	9	2	IC FF TTL LS J-K NEG-EDGE-TRIG	01295	8N74LS112N
A10VR1	1902-3203	6	2	DIODE-ZNR 14.7V 5% DO-7 PD=.4W TC=+.057%	28480	1902-3203
A10VR2	1902-0048	1	1	DIODE-ZNR 6.81V 5% DO-7 PD=.4W TC=+.043%	28480	1902-0048
A10VR3	1902-3094	3	2	DIODE-ZNR 5.11V 2% DO-7 PD=.4W TC=+.009%	28480	1902-3094
A10VR4	1902-3094	3		DIODE-ZNR 5.11V 2% DO-7 PD=.4W TC=+.009%	28480	1902-3094
A10VR5	1902-0782	0	1	DIODE-ZNR 30.1V 10% DO-15 PD=.1W	28480	1902-0782

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10VR6	1902-3182	0	1	DIODE-ZNR 12.1V 5% DO-7 PD=.4W TC=+.064%	28480	1902-3182
A10VR7	1902-0766	0	1	DIODE-ZNR 18.2V 5% DO-7 PD=.4W TC=+.066%	28480	1902-0766
A10VR8	1902-3203	6	1	DIODE-ZNR 14.7V 5% DO-7 PD=.4W TC=+.057%	28480	1902-3203
A10VR9	1902-3092	1	1	DIODE-ZNR 4.99V 2% DO-7 PD=.4W TC=-.012%	28480	1902-3092
A11	01610-66533	8	2	MOTHER BOARD ASSEMBLY	28480	01610-66533
A11C1	0160-3443	1		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-3443
A11J1	1251-3675	5	1	CONNECTOR 3-PIN M POST TYPE	28480	1251-3675
A11J2	1251-0513	4	1	CONNECTOR 5-PIN M POST TYPE	28480	1251-0513
A11J3	1251-3197	6	1	CONNECTOR 12-PIN M POST TYPE	28480	1251-3197
A11J4	1251-3192	1	1	CONNECTOR 3-PIN M POST TYPE	28480	1251-3192
A11R1	0698-8150	6	2	RESISTOR 560 10% .125W CC TC=-330/+800	01121	BB5611
A11R2	0698-8150	6		RESISTOR 560 10% .125W CC TC=-330/+800	01121	BB5611
A11TB1	0360-2001	9	1	BARRIER BLOCK 5-TERM SGL SCREW FEED-THRU	28480	0360-2001
A11U1	1810-0288	6	5	NETWORK-RES 10-PIN-SIP .1-PIN-SPCG	28480	1810-0288
A11U2	1810-0288	6		NETWORK-RES 10-PIN-SIP .1-PIN-SPCG	28480	1810-0288
A11U3	1810-0288	6		NETWORK-RES 10-PIN-SIP .1-PIN-SPCG	28480	1810-0288
A11U4	1810-0288	6		NETWORK-RES 10-PIN-SIP .1-PIN-SPCG	28480	1810-0288
A11U5	1810-0288	6		NETWORK-RES 10-PIN-SIP .1-PIN-SPCG	28480	1810-0288
A11U6	1820-0269	4		IC GATE TTL NAND QUAD 2-INP	01295	SN7403N
A11XA1	1251-4532	5	8	CONNECTOR-PC EDGE 35-CONT/ROW 2-ROWS	28480	1251-4532
A11XA2	1251-4532	5		CONNECTOR-PC EDGE 35-CONT/ROW 2-ROWS	28480	1251-4532
A11XA3	1251-4532	5		CONNECTOR-PC EDGE 35-CONT/ROW 2-ROWS	28480	1251-4532
A11XA4	1251-4532	5		CONNECTOR-PC EDGE 35-CONT/ROW 2-ROWS	28480	1251-4532
A11XA5	1251-4532	5		CONNECTOR-PC EDGE 35-CONT/ROW 2-ROWS	28480	1251-4532
A11XA6	1251-4532	5		CONNECTOR-PC EDGE 35-CONT/ROW 2-ROWS	28480	1251-4532
A11XA7	1251-4532	5		CONNECTOR-PC EDGE 35-CONT/ROW 2-ROWS	28480	1251-4532
A11XA8	1251-4532	5		CONNECTOR-PC EDGE 35-CONT/ROW 2-ROWS	28480	1251-4532
A11XA9	1251-1887	7	1	CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	28480	1251-1887
A11XA10	1251-2150	9	1	CONNECTOR-PC EDGE 22-CONT/ROW 1-ROW	28480	1251-2150
A12	01610-66512	3	2	KEYBOARD ASSEMBLY	28480	01610-66512
A12C1	0160-3443	1		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-3443
A12C2	0160-3443	1		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-3443
A12C3	0180-0230	0		CAPACITOR-FXD .1UF+-20% 50VDC TA	56289	150D105X0050A2
A12C4	0180-0230	0		CAPACITOR-FXD .1UF+-20% 50VDC TA	56289	150D105X0050A2
A12C5	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C6	0180-1745	4	1	CAPACITOR-FXD 1.5UF+-10% 20VDC TA	56289	150D155X9020A2
A12C7	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C8	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C9	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C10	0160-2264	2	8	CAPACITOR-FXD 20PF +-5% 500VDC CER 0+-30	28480	0160-2264
A12C11	0160-2205	0		CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2205
A12C12	0140-0196	3	1	CAPACITOR-FXD 150PF +-5% 300VDC MICA	72136	DM15F151J0300HV1CR
A12C13	0160-2264	2		CAPACITOR-FXD 20PF +-5% 500VDC CER 0+-30	28480	0160-2264
A12C14	0160-2264	2		CAPACITOR-FXD 20PF +-5% 500VDC CER 0+-30	28480	0160-2264
A12C15	0160-2264	2		CAPACITOR-FXD 20PF +-5% 500VDC CER 0+-30	28480	0160-2264
A12C16	0160-2264	2		CAPACITOR-FXD 20PF +-5% 500VDC CER 0+-30	28480	0160-2264
A12C17	0160-2264	2		CAPACITOR-FXD 20PF +-5% 500VDC CER 0+-30	28480	0160-2264
A12C18	0160-2264	2		CAPACITOR-FXD 20PF +-5% 500VDC CER 0+-30	28480	0160-2264
A12C19	0160-2264	2		CAPACITOR-FXD 20PF +-5% 500VDC CER 0+-30	28480	0160-2264
A12CR1	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A12H1	0380-0585	2	7	STANDOFF-RVT-ON .531-IN-LG 6-32THD	00000	ORDER BY DESCRIPTION
A12H2	2360-0113	2	7	SCREW-MACH 6-32 .25-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A12J1	1251-4591	6	2	CONNECTOR 14-PIN M POST TYPE	28480	1251-4591
A12MP1	01610-04101	6	1	PLATE, SWITCH SUPPORT	28480	01610-04101
A12Q1	1854-0215	1		TRANSISTOR NPN 8I PD=350MW FT=300MHZ	04713	2N3904
A12Q2	1854-0215	1		TRANSISTOR NPN 8I PD=350MW FT=300MHZ	04713	2N3904
A12Q3	1853-0015	7	1	TRANSISTOR PNP 8I PD=200MW FT=500MHZ	28480	1853-0015
A12Q4	1854-0246	8		TRANSISTOR NPN 8I PD=350MW FT=250MHZ	04713	8P8 233
A12R1	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A12R2	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A12R3	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A12R4	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A12R5	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A12R6	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A12R7	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A12R8	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A12R9	0757-0284	7		RESISTOR 150 1% .125W F TC=0+-100	24546	C4-1/8-T0-151-F
A12R10	0757-0284	7		RESISTOR 150 1% .125W F TC=0+-100	24546	C4-1/8-T0-151-F

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A12R11	0757-0284	7		RESISTOR 150 1X .125W F TC=0+-100	24546	C4=1/8-T0=151-F
A12R12	0757-0284	7		RESISTOR 150 1X .125W F TC=0+-100	24546	C4=1/8-T0=151-F
A12R13	0757-0284	7		RESISTOR 150 1X .125W F TC=0+-100	24546	C4=1/8-T0=151-F
A12R14	0757-0284	7		RESISTOR 150 1X .125W F TC=0+-100	24546	C4=1/8-T0=151-F
A12R15	0757-0284	7		RESISTOR 150 1X .125W F TC=0+-100	24546	C4=1/8-T0=151-F
A12R16	0757-0284	7		RESISTOR 150 1X .125W F TC=0+-100	24546	C4=1/8-T0=151-F
A12R17	0698-3151	7	2	RESISTOR 2.87K 1X .125W F TC=0+-100	24546	C4=1/8-T0=2871-F
A12R18	0698-3151	7		RESISTOR 2.87K 1X .125W F TC=0+-100	24546	C4=1/8-T0=2871-F
A12R19	0757-0416	7		RESISTOR 511 1X .125W F TC=0+-100	24546	C4=1/8-T0=511R-F
A12R20	0757-0280	3		RESISTOR 1K 1X .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A12R21	0757-0290	5		RESISTOR 6.19K 1X .125W F TC=0+-100	19701	MF4C1/8-T0=6191-F
A12R22	0757-0280	3		RESISTOR 1K 1X .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A12R23	0757-0280	3		RESISTOR 1K 1X .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A12R24	0757-0401	0		RESISTOR 100 1X .125W F TC=0+-100	24546	C4=1/8-T0=101-F
A12R25	0757-0442	9		RESISTOR 10K 1X .125W F TC=0+-100	24546	C4=1/8-T0=1002-F
A12R26	0757-0394	0		RESISTOR 51.1 1X .125W F TC=0+-100	24546	C4=1/8-T0=511R-F
A12R27	0698-3158	4		RESISTOR 23.7K 1X .125W F TC=0+-100	24546	C4=1/8-T0=2372-F
A12R28	0757-0280	3		RESISTOR 1K 1X .125W F TC=0+-100	24546	C4=1/8-T0=1001-F
A12R29	0757-0411	2	1	RESISTOR 332 1X .125W F TC=0+-100	24546	C4=1/8-T0=332R-F
A12R30	0757-0420	3		RESISTOR 750 1X .125W F TC=0+-100	24546	C4=1/8-T0=751-F
A12B1- A12B47	3101-2137	7	47	SWITCH, PUSHBUTTON	28480	3101-2137
A12U1	1820-1422	3	1	IC MV TTL LS MONOSTBL RETRIG	01295	8N74LS122N
A12U2	1820-1415	4	1	IC SCHMITT-TRIG TTL LS NAND DUAL 4-INP	01295	8N74LS13N
A12U3	1820-1574	6	1	IC FF TTL LS J-K PULSE CLEAR DUAL	01295	8N74LS73AN
A12U4	1820-0491	4	1	IC DCDR TTL BCD-T0=DEC 4-T0=10-LINE	01295	8N74145N
A12U5	1820-1478	9		IC CNTR TTL LS BIN ASYNCHRO	01295	8N74LS93N
A12U6	1820-1478	9		IC CNTR TTL LS BIN ASYNCHRO	01295	8N74LS93N
A12U7	1821-0002	5	2	TRANSISTOR ARRAY	0192B	CA3045
A12U8	1820-0622	3		IC MUXR/DATA=SEL TTL 8-T0=1-LINE 8-INP	01295	8N74151AN
A12U9	1821-0002	5		TRANSISTOR ARRAY	0192B	CA3045
A13	01610-66513	4	7	THRESHOLD BOARD ASSEMBLY	28480	01610-66513
A13C1	0160-3443	1		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-3443
A13C2	0160-3443	1		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-3443
A13C3	0160-3443	1		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-3443
A13C4	0160-3443	1		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-3443
A13C5	0160-3443	1		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-3443
A13J1	1251-4591	6		CONNECTOR 14-PIN M POST TYPE	28480	1251-4591
A13R1	2100-3588	1	5	RESISTOR-TRMR 10K 20% CCP TOP-ADJ 1-TRN	28480	2100-3588
A13R2	0698-3152	8	5	RESISTOR 3.48K 1X .125W F TC=0+-100	24546	C4=1/8-T0=3481-F
A13R3	0757-0415	6		RESISTOR 475 1X .125W F TC=0+-100	24546	C4=1/8-T0=475R-F
A13R4	2100-3588	1		RESISTOR-TRMR 10K 20% CCP TOP-ADJ 1-TRN	28480	2100-3588
A13R5	0698-3152	8		RESISTOR 3.48K 1X .125W F TC=0+-100	24546	C4=1/8-T0=3481-F
A13R6	0757-0415	6		RESISTOR 475 1X .125W F TC=0+-100	24546	C4=1/8-T0=475R-F
A13R7	2100-3588	1		RESISTOR-TRMR 10K 20% CCP TOP-ADJ 1-TRN	28480	2100-3588
A13R8	0698-3152	8		RESISTOR 3.48K 1X .125W F TC=0+-100	24546	C4=1/8-T0=3481-F
A13R9	0757-0415	6		RESISTOR 475 1X .125W F TC=0+-100	24546	C4=1/8-T0=475R-F
A13R10	2100-3588	1		RESISTOR-TRMR 10K 20% CCP TOP-ADJ 1-TRN	28480	2100-3588
A13R11	0698-3152	8		RESISTOR 3.48K 1X .125W F TC=0+-100	24546	C4=1/8-T0=3481-F
A13R12	0757-0415	6		RESISTOR 475 1X .125W F TC=0+-100	24546	C4=1/8-T0=475R-F
A13R13	2100-3588	1		RESISTOR-TRMR 10K 20% CCP TOP-ADJ 1-TRN	28480	2100-3588
A13R14	0698-3152	8		RESISTOR 3.48K 1X .125W F TC=0+-100	24546	C4=1/8-T0=3481-F
A13R15	0757-0415	6		RESISTOR 475 1X .125W F TC=0+-100	24546	C4=1/8-T0=475R-F
A13R16	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
A13R17	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
A13R18	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
A13R19	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
A13R20	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
A13B1	3101-2118	4	5	SWITCH, TOGGLE, 8PDT	28480	3101-2118
A13B2	3101-2118	4		SWITCH, TOGGLE, 8PDT	28480	3101-2118
A13B3	3101-2118	4		SWITCH, TOGGLE, 8PDT	28480	3101-2118
A13B4	3101-2118	4		SWITCH, TOGGLE, 8PDT	28480	3101-2118
A13B5	3101-2118	4		SWITCH, TOGGLE, 8PDT	28480	3101-2118
A14	01610-66536	1	2	TAP CHANGER ASSEMBLY	28480	01610-66536
A14C1	0160-4962	1	2	CAPACITOR, FXD 250 VAC	28480	0160-4962
A14C2	0160-4962	1		CAPACITOR, FXD 250 VAC	28480	0160-4962
A14C3	0160-3969	6	2	CAPACITOR-FXD .015UF +20PF 250VAC(RMS)	28480	0160-3969
A14C4	0160-3969	6		CAPACITOR-FXD .015UF +20PF 250VAC(RMS)	28480	0160-3969
A14C5	9135-0110	9	1	FILTER-LINE	28480	9135-0110
A14F1	2110-0010	9	1	FUSE 5A 250V FAST-BLO 1.25 X .25 UL (110 Op)	75915	312005
	or					
	2110-0003	0	1	FUSE 3A 250V 1.25 X .25 UL (220 Op)	75915	312003

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A14J1	1251-5292	6	4	CONNECTOR 9-PIN M POST TYPE	28480	1251-5292
A14J2	1251-5786	3	4	CONNECTOR 10-PIN M POST TYPE	28480	1251-5786
A14J3	1251-5292	6		CONNECTOR 9-PIN M POST TYPE	28480	1251-5292
	1251-5786	3		CONNECTOR 10-PIN M POST TYPE	28480	1251-5786
	1251-5292	6		CONNECTOR 9-PIN M POST TYPE	28480	1251-5292
	1251-5786	3		CONNECTOR 10-PIN M POST TYPE	28480	1251-5786
A14J4	1251-5292	6		CONNECTOR 9-PIN M POST TYPE	28480	1251-5292
	1251-5786	3		CONNECTOR 10-PIN M POST TYPE	28480	1251-5786
A14J5	1251-3902	1	1	CONNECTOR 12-PIN M POST TYPE	28480	1251-3902
A14MP1	2110-0269	0		FUSEHOLDER-CLIP TYPE .250-FUSE	28480	2110-0269
A1481	3101-2150	4	1	SWITCH-PB DPDT ALTN 5A 250VAC	28480	3101-2150
A16	01610-66525	8	2	PROBE/DRIVER ASSEMBLY	28480	01610-66525
A16C1	0160-0229	7		CAPACITOR-FXD .33UF+-10% 10VDC TA	56289	150D336X9010B2
A16C2	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A16C3	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A16C4	0160-2197	6	1	CAPACITOR-FXD 10PF +-5% 300VDC MICA	28480	0160-2197
A16C5	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A16CR1-						
A16CR24	1901-0040	1		DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A16L1	9140-0105	3	1	COIL-MLD 8.2UH 10X Q#50 .155DX.375LG-NOM	28480	9140-0105
A16MP1	01610-87601	5	1	CONNECTOR PROBE CHECK	28480	01610-87601
A16J2	01610-06101	0	18	PIN, CONNECTOR	28480	01610-06101
A16J3	01610-06101	0		PIN, CONNECTOR	28480	01610-06101
A16R1	0757-0280	3		RESISTOR 1K 1% .125W F TC0+-100	24546	C4=1/8-T0=1001-F
A16R2	0757-0430	5		RESISTOR 2.21K 1% .125W F TC0+-100	24546	C4=1/8-T0=2211-F
A16R3	0757-0430	5		RESISTOR 2.21K 1% .125W F TC0+-100	24546	C4=1/8-T0=2211-F
A16R4	0757-0430	5		RESISTOR 2.21K 1% .125W F TC0+-100	24546	C4=1/8-T0=2211-F
A16R5	0757-0430	5		RESISTOR 2.21K 1% .125W F TC0+-100	24546	C4=1/8-T0=2211-F
A1681	3101-2378	8	1	SWITCH-PB SPST-N0 MOM BLK-BTN	28480	3101-2378
A16U1	1820-1435	8	2	IC CNTR TTL LS BIN UP/DOWN SYNCHRO	01295	SN74LS669N
A16U2	1820-1435	8		IC CNTR TTL LS BIN UP/DOWN SYNCHRO	01295	SN74LS669N
A16U3	1820-1195	7		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS175N
A16U4	1820-0694	9	1	IC GATE TTL S EXCL-OR QUAD 2-INP	01295	SN74S86N
A16U5	1820-1449	4	1	IC GATE TTL S OR QUAD 2-INP	01295	SN74S32N
A16U6	1820-0629	0	1	IC FF TTL S J-K NEG-EDGE-TRIG	01295	SN74S112N
A16U7	1820-1144	6		IC GATE TTL LS NOR QUAD 2-INP	01295	SN74LS02N
A16W1	01610-61609	9	1	CABLE, SELF-TEST	28480	01610-61609
A18	01610-60103	6	2	POWER SUPPLY ASSEMBLY	28480	01610-60103
A18C1	0160-0164	7	1	CAPACITOR-FXD .039UF +-10% 200VDC POYLE	28480	0160-0164
A18CR1	1901-0727	1	4	DIODE-PWR RECT 35V 60A 10NS DO-5	28480	1901-0727
A18CR2	1901-0727	1		DIODE-PWR RECT 35V 60A 10NS DO-5	28480	1901-0727
A18CR3	1901-0727	1		DIODE-PWR RECT 35V 60A 10NS DO-5	28480	1901-0727
A18CR4	1901-0727	1		DIODE-PWR RECT 35V 60A 10NS DO-5	28480	1901-0727
A18CR5	1906-0224	3	1	DIODE-PW BRDG 600V 25A	04713	MDA2506
A18E1				NOT ASSIGNED		
A18E2	0340-0858	8	1	INSULATOR-XSTR ALUMINUM HD-ANDZ	28480	0340-0858
A18E3	0340-0881	7	1	INSULATOR-FLG-88HG NYLON BLACK	28480	0340-0881
A18E4	1200-0088	1	8	INSULATOR-25-28 STUD	02608	4705A
A18H1	0590-0025	0	2	NUT-HEX-PLSTC LKG 6-32-THD .172-IN-THK	28480	0590-0025
A18H2				NOT ASSIGNED		
A18H3	0624-0268	6	2	SCREW-TPG 4-24 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A18H4	2190-0017	4	6	WASHER-LK HLCL NO. 8 .168-IN-ID	28480	2190-0017
A18H5	2190-0060	7	2	WASHER-LK 4-24 .375-IN-LG PAN-HD-POZI	28480	2190-0060
A18H6				NOT ASSIGNED		
A18H7	2200-0115	0	9	SCREW-MACH 4-40 .75-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A18H8	2360-0117	6	5	SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A18H9	2360-0123	4	11	SCREW-MACH 6-32 .625-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A18H10				NOT ASSIGNED		
A18H11	2950-0036	9	4	NUT-HEX-DBL-CHAM 1/4-28-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
A18H12				NOT ASSIGNED		
A18H13	0380-1193	0	1	SPACER-STANDOFF	28480	0380-1193
A18MP1	0400-0001	1	1	GROMMET-RND .562-IN-ID .75-IN-GRV-OD	28480	0400-0001
A18MP2	1205-0376	0	1	HEAT SINK SGL PLSTC-PWR-PKG	13103	60728
A18MP3	01610-00102	9	1	CHASSIS	28480	01610-00102
A18MP4	01610-00604	6	1	COVER	28480	01610-00604
A18MP5	01610-21105	6	1	HEAT SINK, DIODE	28480	01610-21105
A18MP6	01610-21106	7	1	HEAT SINK, TRANSISTOR	28480	01610-21106
A18MP7	01610-21108	9	1	HEAT SINK	28480	01610-21108
A18MP8	01610-21109	0	1	HEAT SINK	28480	01610-21109

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A18Q1	1854-0671	3	1	TRANSISTOR NPN 2N6282 SI TO-3 PD=160W	04713	2N6282
A18Q2	1854-0827	1	2	TRANSISTOR NPN SI TO-220AB PD=100W	04713	MJE-13009
A18Q3	1854-0827	1		TRANSISTOR NPN SI TO-220AB PD=100W	04713	MJE-13009
A18Q4				NOT ASSIGNED		
A18Q5				NOT ASSIGNED		
A18R1	0698-3601	2	1	RESISTOR 10 5% 2W MO IC=0+-200	27167	FP42-2-T00-100R0-J
A18T1	9100-0449	4	2	TRANSFORMER, POT CORE	28480	9100-0449
A18W1	01610-61627	1	1	CABLE +12, -12	28480	01610-61627
A18W2	01610-61628	2	1	CABLE, TRANSISTOR	28480	01610-61628
A18W3	01610-61629	3	1	CABLE, POWER OUTPUT	28480	01610-61629
A18W4	01610-61630	6	1	CABLE, +5 DIODES	28480	01610-61630
A18W5	01610-61631	7	1	CABLE, BRIDGE	28480	01610-61631
A18W6	01610-61632	8	1	CABLE, TAP CHANGER	28480	01610-61632
A18W7	64100-61617	4	2	CABLE, XSTER	28480	64100-61617
A18W8	64100-61617	4		CABLE, XSTER	28480	64100-61617
A18W9	01610-61634	1		CABLE, -5 DIODES	28480	01610-61634
A18A1	01610-66537	2	1	PRIMARY BOARD	28480	01610-66537
A18A1C1	0180-2942	5	2	CAPACITOR-FXD 400UF+50-10% 200VDC AL	28480	0180-2942
A18A1C2	0180-2942	5		CAPACITOR-FXD 400UF+50-10% 200VDC AL	28480	0180-2942
A18A1C3	0160-4928	9	2		28480	0160-4928
A18A1C4	0160-4928	9			28480	0160-4928
A18A1C5	0160-2387	0	2	CAPACITOR-FXD 1000PF +-1% 500VDC MICA	28480	0160-2387
A18A1C6	0160-2387	0		CAPACITOR-FXD 1000PF +-1% 500VDC MICA	28480	0160-2387
A18A1C7	0180-0100	3	1	CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	1500475X903582
A18A1C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A18A1C9	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A18A1C10	0180-2945	8	1	CAPACITOR-FXD 100UF+50-10% 35VDC AL	28480	0180-2945
A18A1C11	0150-0024	7		CAPACITOR-FXD .02UF +80-20% 600VDC CER	28480	0150-0024
A18A1C12	0150-0024	7		CAPACITOR-FXD .02UF +80-20% 600VDC CER	28480	0150-0024
A18A1C13	0150-0024	7		CAPACITOR-FXD .02UF +80-20% 600VDC CER	28480	0150-0024
A18A1C14	0150-0024	7		CAPACITOR-FXD .02UF +80-20% 600VDC CER	28480	0150-0024
A18A1C15	0180-2947	0	1	CAPACITOR-FXD 100UF+50-10% 16VDC AL	28480	0180-2947
A18A1C16	0180-2946	9	1	CAPACITOR-FXD 330UF+50-10% 35VDC AL	28480	0180-2946
A18A1C17	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A18A1C18	0140-0149	6	2	CAPACITOR-FXD 470PF +-5% 300VDC MICA	72136	DM15F471J0300WV1CR
A18A1C19	0140-0149	6		CAPACITOR-FXD 470PF +-5% 300VDC MICA	72136	DM15F471J0300WV1CR
A18A1C20	0160-4834	6	2	CAPACITOR-FXD .047UF +-10% 100VDC CER	28480	0160-4834
A18A1C21	0160-4834	6		CAPACITOR-FXD .047UF +-10% 100VDC CER	28480	0160-4834
A18A1CR1	1901-0029	6	5	DIODE-PWR RECT 600V 750MA DO-29	28480	1901-0029
A18A1CR2	1901-0029	6		DIODE-PWR RECT 600V 750MA DO-29	28480	1901-0029
A18A1CR3	1901-0029	6		DIODE-PWR RECT 600V 750MA DO-29	28480	1901-0029
A18A1CR4	1901-0029	6		DIODE-PWR RECT 600V 750MA DO-29	28480	1901-0029
A18A1CR5	1901-0029	6		DIODE-PWR RECT 600V 750MA DO-29	28480	1901-0029
A18A1CR6	1901-0719	1	2	DIODE-PWR RECT 400V 3A 300NS	28480	1901-0719
A18A1CR7	1901-0719	1		DIODE-PWR RECT 400V 3A 300NS	28480	1901-0719
A18A1CR8	1906-0006	9	1	DIODE-FW BRDG 400V 1A	28480	1906-0006
A18A1L1	9140-0254	3	2	COIL 430UH 10% .6DX1.6LG-NOM	28480	9140-0254
A18A1L2	9140-0254	3		COIL 430UH 10% .6DX1.6LG-NOM	28480	9140-0254
A18A1MP1	1205-0373	7	1	HEAT SINK SGL PLSTC-PWR-PKG	13103	6030B-TT
A18A1MP2	0340-0871	5	1	INSULATOR-FLG-BBHG NYLON BLACK	28480	0340-0871
A18A1R1	0764-0027	1	2	RESISTOR 75K 5% 2W MO TC=0+-200	28480	0764-0027
A18A1R2	0764-0027	1		RESISTOR 75K 5% 2W MO TC=0+-200	28480	0764-0027
A18A1R3	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A18A1R4	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A18A1R5	0698-3629	4		RESISTOR 270 5% 2W MO TC=0+-200	28480	0698-3629
A18A1R6	0698-3629	4		RESISTOR 270 5% 2W MO TC=0+-200	28480	0698-3629
A18A1R7	0698-3629	4	3	RESISTOR 270 5% 2W MO TC=0+-200	28480	0698-3629
A18A1R8	0698-3624	9	2	RESISTOR 150 5% 2W MO TC=0+-200	28480	0698-3624
A18A1R9	0698-3624	9		RESISTOR 150 5% 2W MO TC=0+-200	28480	0698-3624
A18A1R10	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18A1R11	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18A1RT1	0837-0172	2	1	THERMISTOR DT8C 2.5-OHM	15454	8G-3
A18A1RV1	0837-0120	0	2	VARIATOR VIN=130VAC ENERGY=20JOULES	03508	V130LA20B
A18A1RV2	0837-0120	0		VARIATOR VIN=130VAC ENERGY=20JOULES	03508	V130LA20B
A18A1T1	9100-0420	1	2	TRANSFORMER-PULSE	28480	9100-0420
A18A1T2	9100-0420	1		TRANSFORMER-PULSE	28480	9100-0420
A18A1T3	9100-0417	6	1	TRANSFORMER-POWER 115/230V 48-66HZ	28480	9100-0417
A18A1U1	1826-0649	6	1	IC, 79M12	28480	1826-0649
A18A1U2	1826-0345	9	1	IC V RGLTR TO-220	07263	UA78M12UC
A18A2	01610-66548	5	1	CONTROL BOARD	28480	01610-66548

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A18A2C1	0160-2055	9	3	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A18A2C2	0160-3448	6		CAPACITOR-FXD 1000PF +—10% 1KVDC CER	28480	0160-3448
A18A2C3	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A18A2C4	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A18A2C5	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A18A2C6	0160-3508	9	2	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A18A2C7	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A18A2C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A18A2C9	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A18A2C10	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A18A2C11	0160-3508	9	1	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A18A2C12	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A18A2C13	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A18A2C14	0140-0180	5		CAPACITOR-FXD 2000PF +—2% 300VDC MICA	72136	DM19F20200300MV1CR
A18A2C15	0160-3448	6		CAPACITOR-FXD 1000PF +—10% 1KVDC CER	28480	0160-3448
A18A2C16	0160-3448	2	1	CAPACITOR-FXD 1000PF +—10% 1KVDC CER	28480	0160-3448
A18A2C17	0180-3046			CAPACITOR-FXD 3300PF +75-10% 6.3VDC	00853	30J33206R3B
A18A2C18	0180-2706			CAPACITOR-FXD 3100UF+75-10% 16VDC AL	00853	300JJ312U016B
A18A2C19	0180-2948			CAPACITOR-FXD 1000UF+50-10% 10VDC AL	28480	0180-2948
A18A2C20	0180-0228			CAPACITOR-FXD 22UF+—10% 15VDC TA	56289	150D226X901582
A18A2C21	0180-0155	6	1	CAPACITOR-FXD 2.2UF+—20% 20VDC TA	56289	150D225X0020A2
A18A2C22	0160-2055	9	5	CAPACITOR-FXD .01UF +80-20% 100VDC CER	56289	C023F101F103Z52-CDH
A18A2C23	0180-0155	8		CAPACITOR-FXD 2.2UF +—20% 20 VDC TA	56289	150D225X0020A2
A18A2CR1	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18A2CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18A2CR3	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A18A2CR4	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A18A2DS1	1990-0486	6	1	LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0486
A18A2L1	9140-0343	1	2	COIL 50UH 10% 10X1.625LG-MAX SRF=4MMHZ	09969	IM-15-50
A18A2L2	9140-0343	1		COIL 50UH 10% 10X1.625LG-MAX SRF=4MMHZ	09969	IM-15-50
A18A2L3	9140-0242	9	1	COIL 100UH 10% .937DX1.625LG-NOM	28480	9140-0242
A18A2Q1	1853-0314	9		TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	04713	2N2905A
A18A2Q2	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A18A2Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A18A2Q4	1853-0036	2	2	TRANSISTOR PNP SI PD=310MW FT=250MHZ	04713	SPS3612
A18A2Q5	1884-0074	3	2	THYRISTOR-SCR 2N5060 TO-92 VRRM=30	04713	2N5060
A18A2Q6	1884-0074	3		THYRISTOR-SCR 2N5060 TO-92 VRRM=30	04713	2N5060
A18A2Q7	1884-0266	5	2	THYRISTOR-SCR 2N6400 TO-220 AB VRRM=50	04713	2N6400
A18A2Q8	1884-0266	5		THYRISTOR-SCR 2N6400 TO-220 AB VRRM=50	04713	2N6400
A18A2R1	0811-1853	4	1	RESISTOR 25 5% 5W PW TC=0+—20	28480	0811-1853
A18A2R2	0757-0814	9	1	RESISTOR 511 1% 5W F TC=0+—100	28480	0757-0814
A18A2R3	0698-3429	2	3	RESISTOR 19.6 1% .125W F TC=0+—100	03888	PME55-1/8-T0-19R6-F
A18A2R4	0698-3449	6	1	RESISTOR 28.7K 1% .125W F TC=0+—100	24546	C4-1/8-T0-2872-F
A18A2R5	0698-3243	8	1	RESISTOR 178K 1% .125W F TC=0+—100	24546	C4-1/8-T0-1783-F
A18A2R6	0757-0442	9	8	RESISTOR 10K 1% .125W F TC=0+—100	24546	C4-1/8-T0-1002-F
A18A2R7	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+—100	24546	C4-1/8-T0-1002-F
A18A2R8	0757-0439	4	1	RESISTOR 6.81K 1% .125W F TC=0+—100	24546	C4-1/8-T0-6881-F
A18A2R9	0757-0442	9	8	RESISTOR 10K 1% .125W F TC=0+—100	24546	C4-1/8-T0-1002-F
A18A2R10	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+—100	24546	C4-1/8-T0-1002-F
A18A2R11	0757-0459	8	2	RESISTOR 56.2K 1% .125W F TC=0+—100	24546	C4-1/8-T0-5622-F
A18A2R12	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+—100	24546	C4-1/8-T0-1002-F
A18A2R13	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+—100	24546	C4-1/8-T0-5112-F
A18A2R14	0757-0465	6	3	RESISTOR 100K 1% .125W F TC=0+—100	24546	C4-1/8-T0-1003-F
A18A2R15	0757-0465	6	3	RESISTOR 100K 1% .125W F TC=0+—100	24546	C4-1/8-T0-1003-F
A18A2R16	0757-0465	6	3	RESISTOR 100K 1% .125W F TC=0+—100	24546	C4-1/8-T0-1003-F
A18A2R17	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+—100	24546	C4-1/8-T0-1002-F
A18A2R18	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+—100	24546	C4-1/8-T0-1002-F
A18A2R19	0757-0409	8	2	RESISTOR 274 1% .125W F TC=0+—100	24546	C4-1/8-T0-274R-F
A18A2R20	0698-0085	0		RESISTOR 2.61K 1% .125W F TC=0+—100	24546	C4-1/8-T0-2611-F
A18A2R21	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+—100	24546	C4-1/8-T0-1212-F
A18A2R22	0757-0481	6	4	RESISTOR 43.2K 1% .125W F TC=0+—100	19701	MF4C1/8-T0-4753-F
A18A2R23	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+—100	24546	C4-1/8-T0-1002-F
A18A2R24	0757-0394	0	3	RESISTOR 51.1K 1% .125W F TC=0+—100	24546	C4-1/8-T0-51R1-F
A18A2R25	0757-0394	0		RESISTOR 51.1K 1% .125W F TC=0+—100	24546	C4-1/8-T0-51R1-F
A18A2R26	0757-0394	0		RESISTOR 51.1K 1% .125W F TC=0+—100	24546	C4-1/8-T0-51R1-F
A18A2R27	0757-0458	7	2	RESISTOR 51.1K 1% .125W F TC=0+—100	24546	C4-1/8-T0-5112-F
A18A2R28	0698-3429	2	3	RESISTOR 19.6 1% .125W F TC=0+—100	03888	PME55-1/8-T0-19R6-F
A18A2R29	0757-0431	6	1	RESISTOR 2.43K 1% .125W F TC=0+—100	24546	C4-1/8-T0-2431-F
A18A2R30	0757-0409	8	2	RESISTOR 274 1% .125W F TC=0+—100	24546	C4-1/8-T0-274R-F
A18B9R31	0767-0431	6	3	RESISTOR 2.43K 1% .125W F TC=0+—100	24546	C4-1/8-T0-2431-F
A18A2R32	0757-0481	7		RESISTOR 475K 1% .125W F TC=0+—100	19701	MF4C-1/8-T0-4753-F
A18A2R33	0758-0083	6	1	RESISTOR 68 5% .25W F TC=0+—100	24546	C5-1/4-T0-68R0-J
A18A2R34	0757-0431	6	3	RESISTOR 2.43K 1% .125W F TC=0+—100	24546	C4-1/8-T0-2431-F
A18A2R35	0698-3429	2	3	RESISTOR 19.6 1% .125W F TC=0+—100	03888	PME55-1/8-T0-19R6-F
A18A2R36	0760-0024	0	1	RESISTOR 100 5% 1W MO TC=0+—200	28480	0760-0024
A18A2R37	0757-0281	4		RESISTOR 2.74K 1% .125W F TC=0+—100	24546	C4-1/8-T0-2741-F
A18A2R38	0757-0281	4		RESISTOR 2.74K 1% .125W F TC=0+—100	24546	C4-1/8-T0-2741-F
A18A2R39	0757-0436	0	2	RESISTOR 3.92K 1% .125W F TC=0+—100	24546	C4-1/8-T0-3921-F
A18A2R40	0757-0436	0		RESISTOR 3.92K 1% .125W F TC=0+—100	24546	C4-1/8-T0-3921-F
A18A2R41	0757-0453	2	1	RESISTOR 30.1K 1% .125W F TC=0+—100	24546	C4-1/8-T0-3012-F
A18A2R42	0760-0024	0	2	RESISTOR 100 5% 1W MO TC=0+—200	28480	0760-0024
A18A2R43	0760-0024	0		RESISTOR 100 5% 1W MO TC=0+—200	28480	0760-0024
A18A2R44	0757-0435	0		RESISTOR 3.92K 1% .125W F TC=0+—100	24546	C4-1/8-T0-3921-F
A18A2R45	5020-2519	9	2	RESISTOR .SEN 2M-OHM	28480	5020-2519

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A18A2R46	63312-8001	4	1	RESISTOR, SEN 5M-OHM	28480	63312-80001
A18A2R47	2100-3095	9	1	RESISTOR-TRMR 200 10% C SIDE-ADJ 17-TRN	02111	43P201
A18A2R48	2100-3056	8	1	RESISTOR-TRMR 5K 10% C SIDE-ADJ 17-TRN	02111	43P502
A18A2R49	2100-3123	0	1	RESISTOR TRMR 500 10% C SIDE-ADJ 17-TRN	02111	43P501
A18A2R50	2100-3052	4	2	RESISTOR TRMR 50 10% C SIDE-ADJ 17-TRN	02111	43P500
A18A2R51	0757-0338	2	1	RESISTOR 1K 1% .25W F TC=0+-100	24546	C5-1/4-T0-1001-F
A18A2R52	0757-0431	6		RESISTOR 2.43K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2431-F
A18A2R53	0757-0435	0		RESISTOR 3.92K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3921-F
A18A2R54	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A18A2R55	0757-0446	3		RESISTOR 15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1502-F
A18A2R56	0757-0446	3		RESISTOR 15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1502-F
A18A2R57	0757-0029	0	1	RESISTOR 470 5% .25W F TC=0+-100	24546	C5-1/4-T0-471-J
A18A2R58	0757-0280	3	1	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18A2TP1	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A18A2TP2	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A18A2TP3	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A18A2U1	1826-0565	5	1	PWM—POWER SUPPLY CONTROLLER	28480	1826-0565
A18A2U2	1820-2243	8	1	IC TTL LED DRVR	01295	SN75469N
A18A2U3	1826-0004	7		IC 304 V RGLTR T0-100	07263	UA304HC
A18A2U4	1826-0003	6	1	OP AMP GP T0-99	04713	MC1456CG
A18A2U5	1826-0468	7	2	COMPARATOR GP 8-DIP-P	04713	MC3423P1
A18A2U6	1826-0468	7		COMPARATOR GP 8-DIP-P	04713	MC3423P1
A18A2VR1	1902-1173	5	1	DIODE ZNR 1N4104 10V 5% D0-7 PD=.25W	12594	1N4014

Table 6-3. List of Manufacturers' Codes

Mfr No.	Manufacturer Name	Address	Zip Code
00000	ANY SATISFACTORY SUPPLIER		90021
00466	NORELCO NORTH AMER PHILIPS LTG CORP	LOS ANGELES CA	29671
00853	SANGAMO ELEC CO S CAROLINA DIV	PICKENS SC	53204
01121	ALLEN-BRADLEY CO	MILWAUKEE WI	75222
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS TX	08876
0192B	RCA CORP SOLID STATE DIV	SOMERVILLE NJ	91745
02111	SPECTROL ELECTRONICS CORP	CITY OF IND CA	07981
03888	KDI PYROFILM CORP	WHIPPANY NJ	85062
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX AZ	94042
07263	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW CA	57078
09969	DALE ELECTRONICS INC	YANKTON SD	85252
12954	SIEMENS CORP COMPONENTS GROUP	SCOTTSDALE AZ	75234
13103	THERMALLOY CO	DALLAS TX	92806
15454	RODAN INDUSTRIES INC	ANAHEIM CA	94086
18324	SIGNETICS CORP	SUNNYVALE CA	76067
19701	MEPCO/ELECTRA CORP	MINERAL WELLS TX	16701
24546	CORNING GLASS WORKS (BRADFORD)	BRADFORD PA	90404
26654	VARADYNE INC	SANTA MONICA CA	95051
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA CA	28401
27167	CORNING GLASS WORKS (WILMINGTON)	WILMINGTON NC	94304
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO CA	92716
2M627	R-OHM CORPORATION	IRVINE CA	03246
30161	AAVID ENGINEERING INC	LACONIA NH	92507
32997	BOURNS INC TRIMPOT PROD DIV	RIVERSIDE CA	13035
52763	STETTNER-TRUSH INC	CAZENOVIA NY	01247
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS MA	50501
71590	CENTRALAB ELEK DIV GLOBE-UNION INC	MILWAUKEE WI	06226
72136	ELECTRO MOTIVE CORP SUB IEC	WILLIMANTIC CT	16512
72982	ERIE TECHNOLOGICAL PRODUCTS INC	ERIE PA	19108
75042	TRW INC PHILADELPHIA DIV	PHILADELPHIA PA	60016
75915	LITTELFUSE INC	DES PLAINES IL	10710
83701	ELECTRONIC DEVICES INC	YONKERS NY	68601
91637	DALE ELECTRONICS INC	COLUMBUS NE	

See introduction to this section for ordering information

SECTION VII

MANUAL CHANGES

7-1. INTRODUCTION.

7-2. This section contains information required to back-date or update this manual for a specific instrument.

7-3. MANUAL CHANGES.

7-4. This manual applies directly to the instrument having the serial prefix shown on the manual title page. If the serial prefix of your instrument is not the same as the one on the title page, find your serial prefix in table 7-1 and make the changes to the manual that are listed for that serial prefix. When making changes listed in table 7-1, make the change with the highest number first. Example: if backdating changes 1, 2, and 3 are required for your serial prefix, do change 3 first, then change 2, and finally change 1.

7-5. If the serial prefix of your instrument is not listed either on the title page or in table 7-1, refer to an enclosed MANUAL CHANGES sheet for updating information. Also, if a MANUAL CHANGES sheet is supplied, make all indicated ERRATA corrections.

Table 7-1. Serial Prefix Make Changes

Serial Prefix	Make Changes
1916A	1
1940A	2 and 1

CHANGE 1

Paragraph 5-15,

Replace paragraph 5-15, ΔT ADJUSTMENT with figure 7-1.

Table 6-2,

A6: Change HP Part No. and Mfr Part No. to 01610-66530.

A9: Change HP Part No. and Mfr Part No. to 01610-66541.

Delete: MP 93.

W10: Change HP Part No. and Mfr Part No. to 01610-61605.

A1C101: Change to HP Part No. 0140-0176, CD 9, Qty 2, CAPACITOR-FXD 100 PF $\pm 2\%$ 300VDC MICA, Mfr Code 72136, Mfr Part No. DM15F101G-0300WV1CR.

A1CR2: Change to HP Part No. 1901-0400, CD 1, DIODE-SWITCHING 30V 50MA 2NS D0-35, Mfr Code 28480, Mfr Part No. 1901-0040.

A1R2: Change Qty to 15.

A1R57: Change Qty to 63.

A1R79: Change Qty to 16.

A1U34: Change Qty to 14.

Delete: A1XU11.

Delete: A1XU53.

A3C15: Change to HP Part No. 0140-0197, CD 4, Qty 3, CAPACITOR-FXD 180PF $\pm 5\%$ 300VDC MICA, Mfr Code 72136, Mfr Part No. DM15F181J-0300WV1CR.

A3C16: Change to HP Part No. 0160-2197, CD 0, Qty 3, CAPACITOR-FXD 10PF $\pm 5\%$ 300VDC MICA, Mfr Code 28480, Mfr Part No. 0160-2197.

A3C18: Change to HP Part No. 0140-0197, CD 4, CAPACITOR-FXD 180PF $\pm 5\%$ 300VDC MICA, Mfr Code 72136, Mfr Part No. DM15F181J0300-WV1CR.

A3C19: Change to HP Part No. 0160-2197, CD 0, CAPACITOR-FXD 10PF $\pm 5\%$ 300VDC MICA, Mfr Code 28480, Mfr Part No. 0160-2197.

A3C33: Change Qty to Blank.

A3C47: Change Qty to 3.

Delete: A5U14.

A6C47: Change to HP Part No. 0121-0105, CD 4, Qty 1, CAPACITOR-VTRMR-CER 9-35PF 200V PC-MTG, Mfr Code 52763, Mfr Part No. 304324 9/35 PFN650.

A6R22: Change Qty to 2.

A6R39: Change to HP Part No. 0757-0410, CD 1, Qty 1, RESISTOR 301 1% .125 WF TC=0 ± 100 , Mfr Code 24546, Mfr Part No. C4 1/8-TO-301R-F.

Delete: A6R45.

Replace: Pages 6-19 through 6-21 with table 7-2.

A10CR2: Change to HP Part No. 1901-0040, CD 1, DIODE-FW BRDG 30V 50MA, Mfr Code 28480, Mfr Part No. 1901-0040.

A10CR3: Change to HP Part No. 1901-0028, CD 5, Qty 7, DIODE-PWR RECT 400V 750MA D0-29, Mfr Code 28480, Mfr Part No. 1901-0028.

A10CR7: Change to HP Part No. 1901-0040, CD 1, DIODE SWITCHING 30V 50MA 2NS D0-35, Mfr Code 28480, Mfr Part No. 1901-0040.

A10CR9: Change to HP Part No. 1901-0638, CD 3, DIODE-FW BRDG 100V 4A, Mfr Code 04713, Mfr Part No. MDA-970-2.

A10CR10: Change to HP Part No. 1901-0638, CD 3, DIODE-FW BRDG 100V 4A, Mfr Code 04713, Mfr Part No. MDA-970-2.

Delete: A16U6.

Figure 8-11, Schematic 6C,

Modify the circuitry according to figure 7-2.

Figure 8-12, Schematic 7A,

Delete: 9B, 11B (off page designations) on 10 MHz STD line.

Figure 8-13, A9 Component Locator.

Replace A9 Component Locator with figure 7-3.

Replace Schematic 8A with figure 7-4.

Figure 8-13, A9 Component Locator (Cont'd)

Replace Schematic 8C with figure 7-5.

Figure 8-14, Schematic 9B,

C101: Change value to 100 PF.

Add: CR2 in parallel with C101.

Figure 8-16,

Delete: 9B, 10C (off page designations) from line 27.

U60B: Change designation to MEAS STROBE, change clock signal from J to G.

Delete: 10B (off page designation) from line 30.

CHANGE 2

Figure 6-1. Illustrated Parts Breakdown, Replace Detail B with figure 7-6.

Table 6-2,

A10: Change HP Part No. and Mfr Part No. to 01610-66535, CD 0.

A18: Change HP Part No. and Mfr Part No. to 01610-60102, CD 5.

MP64: Change HP Part No. and Mfr Part No. to 01610-01215, CD 7.

Q1: Change to HP Part No. 1854-0573, CD 4, Qty 1, TRANSISTOR NPN SI TO-220AB PD=30W, Mfr Code 04713, Mfr part No. MJE3738.

Q2: Change to HP Part No. 1854-0558, CD 5, Qty 6, TRANSISTOR NPN SI DARL PD=70W FT=1 MHz, Mfr Code 28480, Mfr Part No. 1854-0558.

Delete: T3.

W13: Change HP Part No. and Mfr Part No. to 01610-61620.

W14: Change HP Part No. and Mfr Part No. to 01610-61620.

W20: Change HP Part No. and Mfr Part No. to 01720-61607, CD 0.

W21: Change HP Part No. and Mfr Part No. to 01720-61607, CD 0.

Delete: A2XU1-24.

A3C24: Change to CD 0, Qty 9, CAPACITOR-FXD 82PF $\pm$ 5% 300VDC MICA, Mfr Code 72136, Mfr Part No. DM15E820J0300WVICR.

A3C27: Change to HP Part No. 0160-2308, CD 5, Qty 2, CAPACITOR-FXD 36PF $\pm$ 5% 300VDC MICA, Mfr Code 28480, Mfr Part No. 0160-2308.

A3XU7: Change HP Part No. and Mfr Part No. to 1200-0474, CD 9.

A3XU12: Change HP Part No. and Mfr Part No. to 1200-0474, CD 9.

A3XU31: Change to HP Part No. 1200-0474, CD 9, SOCKET-IC 14-CONT DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0474.

A3XU32: Change to HP Part No. 1200-0474, CD 9, SOCKET-IC 14-CONT DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0474.

A3XU33: Change to HP Part No. 1200-0473, CD 8, SOCKET-IC 16-CONT DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0473.

A3XU36: Change to HP Part No. 1200-0474, CD 9, SOCKET-IC 14-CONT DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0474.

A3XU37: Change to HP Part No. 1200-0474, CD 9, SOCKET-IC 14-CONT DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0474.

A3XU40: Change to HP Part No. 1200-0473, CD 8, SOCKET-IC 16-CONT DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0473.

A3XU41: Change to HP Part No. 1200-0473, CD 8, SOCKET-IC 16-CONT DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0473.

A3XU47: Change to HP Part No. 1200-0473, CD 8, SOCKET-IC 16-CONT DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0473.

A3XU55: Change to HP Part No. 1200-0473, CD 8, SOCKET-IC 16-CONT DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0473.

A3XU64: Change to HP Part No. 1200-0473, CD 8, SOCKET-IC 16-CONT DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0473.

A3XU68: Change to HP Part No. 1200-0473, CD 8, SOCKET-IC 16-CONT DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0473.

A3XU69: Change to HP Part No. 1200-0474, CD 9, SOCKET-IC 14-CONT DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0474.

A3XU72: Change to HP Part No. 1200-0474, CD 9, SOCKET-IC 14-CONT DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0474.

A3XU82: Change to HP Part No. 1200-0474, CD 9, SOCKET-IC 14-CONT DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0474.

A3XU83: Change to HP Part No. 1200-0474, CD 9, SOCKET-IC 14-CONT DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0474.

A3XU84: Change to HP Part No. 1200-0474, CD 9, SOCKET-IC 14-CONT DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0474.

A3XU88: Change to HP Part No. 1200-0474, CD 9, SOCKET-IC 14-CONT DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0474.

Delete: A5XU1.

Delete: A5XU2.

Delete: A5XU5.

Delete: A5XU6.

Delete: A5XU9.

Delete: A5XU10.

Delete: A5XU13.

Delete: A5XU14.

Delete: A5XU41.

A6XU9: Change to HP Part No. 1200-0474, CD 9, SOCKET-IC 14-CONT DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-1474.

A6XU17: Change to HP Part No. 1200-0662, CD 7, Qty 8, SOCKET-IC 24-CONT DIP DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0662.

A6XU18: Change to HP Part No. 1200-0662, CD 7, SOCKET-IC 14-CONT DIP DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0662.

A6XU19: Change to HP Part No. 1200-0662, CD 7, SOCKET-IC 14-CONT DIP DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0662.

- A6XU20: Change to HP Part No. 1200-0662, CD 7, SOCKET-IC 14-CONT DIP DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0662.
- A6XU21: Change to HP Part No. 1200-0662, CD 7, SOCKET-IC 14-CONT DIP DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0662.
- A6XU22: Change to HP Part No. 1200-0662, CD 7, SOCKET-IC 14-CONT DIP DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0662.
- A6XU23: Change to HP Part No. 1200-0662, CD 7, SOCKET-IC 14-CONT DIP DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0662.
- A6XU24: Change to HP Part No. 1200-0662, CD 7, SOCKET-IC 14-CONT DIP DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0662.
- A6XU26: Change to HP Part No. 1200-0660, CD 5, Qty 1, SOCKET-IC 40-CONT DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0660.
- A6XU32: Change to HP part No. 1200-0473, CD 8, SOCKET-IC 16-CONT DIP DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0473.
- A6XU33: Change to HP part No. 1200-0473, CD 8, SOCKET-IC 16-CONT DIP DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0473.
- A6XU47: Change to HP part No. 1200-0473, CD 8, SOCKET-IC 16-CONT DIP DIP-SLDR, Mfr Code 28480, Mfr Part No. 1200-0473.
- A9R11: Change Qty to 3.
- A10: Change HP Part No. and Mfr Part No. to 01610-66535, CD 0, Qty 1.
- A10C24: Change to HP Part No. 0180-0059, CD 1, CAPACITOR-FXD 10UF+75-10% 25VDC AL, Mfr Code 56289, Mfr part No. 30D106G025BB2.
- A10CR2: Change to HP Part No. 1901-0638, CD 3, DIODE-FW BRDG 100V 4A, Mfr Code 04713, Mfr Part No. MDA-970-2.
- Delete: A10CR14.
- A10F3: Change to HP Part No. 2110-0003, CD 0, Qty 3, FUSE 3A 250V FAST-BLO 1.25X.25 UL, Mfr Code 75915, Mfr Part No. 312003.
- A10F4: Change to HP Part No. 2110-0003, CD 0, Qty 3, FUSE 3A 250V FAST-BLO 1.25X.25 UL, Mfr Code 75915, Mfr Part No. 312003.
- Delete: A10H3 through H6.
- Delete: A10MP4.
- A10R18: Change to HP Part No. 0812-0066, CD 1, RESISTOR .33 5% 2W PW TC=+-800, Mfr Code 75042, Mfr Part No. BWH2-33/100-J.
- A10R51: Change to HP Part No. 0757-0401, CD 0, RESISTOR 100 1% .125W FTC=0+-100, Mfr Code 24546, Mfr Part No. C4-1/8-TO-101-F.
- A10R54: Change to HP Part No. 0812-0066, CD 1, RESISTOR .33 5% 2W PW TC=0+-800, Mfr Code 75042, Mfr Part No. BWH2-33/100-J.
- Delete: A10R70.
- Delete: A10R71.
- A11TB1: Change to HP Part No. 0360-0630, CD 6, Qty 1, BARRIER BLOCK 5-TERM SGL SCREW FEED-THRU, Mfr Code 28480, Mfr Part No. 0360-0630.
- A12C11: Change to HP Part No. 0160-2204, CD 0, CAPACITOR-FXD 10PF+-5% 300VDC MICA, Mfr Code 28480, Mfr Part No. 0160-2204.
- A18: Change HP Part No. and Mfr Part No. to 01610-60102, CD 5.
- A18E1: Change to HP Part No. 3040-0614, CD 4, Insulator-XSTR Aluminum HD-ANDZ, Mfr Code 28480, Mfr Part No. 0340-0614.
- A18H6: Change to HP Part No. 2200-0103, CD2, SCREW-MACH 4-4 .25-In-Lg Pan-HD-Pozi, Mfr Code 00000, Mfr Part No. Order by Description.
- A18H10: Change to HP Part No. 2580-0004, CD6, Qty 1, NUT-HEX-DBL-CHAM 8.32 THD .125-IN-THK, Mfr Code, 00000, Mfr Part No. Order by Description.
- A18H12: Change to HP Part No. 3050-0036, CD 6, Qty 2, Insulator-Xstr Nylon, Mfr Code 28480, Mfr Part No. 3050-0036.
- A18Q4: Change to HP Part No. 1884-0266, CD5, Qty 2, THYRISTOR-SCR 2N6400 TO-220A8 VRRM=50, Mfr Code 0192B, Mfr Part No. 2N6400.
- A18Q5: Change to HP Part No. 1884-0266, CD5, THYRISTOR-SCR 2N6400 TO-220AB VRRM=50, Mfr Code 0192B, Mfr Part No. 2N6400.
- A18A2: Change HP Part No. and Mfr Part No. to 01610-66538, CD 5.
- A18A2C17: Change to HP Part No. 0180-2706, CD 9, Qty 2, CAPACITOR-FXD 3100UF+75-10% 16VDC AL, Mfr Code 00853, Mfr Part No. 300JJ312U016B.
- Delete: A18A2C22.
- Delete: A18A2C23.
- Delete A18A2DS1.
- Delete: A18A2Q4.
- Delete: A18A2Q5.
- Delete: A18A2Q6.
- Delete: A18A2Q7.
- Delete: A18A2Q8.
- A18A2R8: Change to HP Part No. 0757-0456, CD 5, Qty 2, RESISTOR 43.2K 1% .125 WF TC=0+-100, Mfr Code 24546, Mfr Part No. C4-1/8-TO-4322-F.
- A18A2R14: Change to HP Part No. 0757-0465, CD 6, Qty 3, RESISTOR 100K 1% .125W F TC=0+-100, Mfr Code 24546, Mfr Part No. C4-1/8-TO-1003-F.
- A18A2R22: Change Qty to 2.
- A18A2R27: Change to HP Part No. 0757-0459, CD 8, Qty 2, RESISTOR 56.2K 1% .125W F TC=0+-100, Mfr Code 24546, Mfr Part No. C4-1/8-TO-5622F.
- A18A2R42: Change to HP Part No. 0698-0093, CD 0, RESISTOR 10 5% 1W MO TC=0+-100, Mfr Code 28480, Mfr Part No. 0698-0093.
- A18A2R43: Change to HP Part No. 0698-0093, CD 0, RESISTOR 10 5% 1W MO TC=1+-100, Mfr Code 28480, Mfr Part No. 0698-0093.
- A18A2R44: Change to HP Part No. 0757-0456, CD 5, Qty 2, RESISTOR 43.2K 1% .125W F TC=0+-100, Mfr Code 24546, Mfr Part No. C4-1/8-TO-4322-F.
- A18A2R46: Change to HP Part No. 5020-2519, CD 9, RESISTOR SEN 2M-OHM, Mfr Code 28480, Mfr Part No. 5020-2514.
- Delete: A18A2R52.
- Delete: A18A2R53.
- Delete: A18A2R54.
- Delete: A18A2R55.
- Delete: A18A2R56.

Table 6-2, (Cont'd)

Delete: A18A2R57.

Delete: A18A2R58.

Delete: A18A2VR1.

Figure 8-8, Service Sheet 3, 5-Volt Power Supply A18A2,

Replace A18A2 Component Locations with figure 7-7.

Replace Schematic 3 with Figure 7-8.

Figure 8-9, Service Sheet 4, Low-voltage Power Supply
Board A10,

Replace A10 Component Locations with figure 7-9.

Replace Schematic 4A with Figure 7-10.

Table 7-2. Replacement for Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6U41	1820-0685	8	1	IC GATE TTL S NAND TPL 3-INP	01295	SN74S10N
A6U42	1820-0681	4		IC GATE TTL S NAND QUAD 2-INP	01295	SN74S00N
A6U43	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A6U44	1820-0328	6		IC GATE TTL NOR QUAD 2-INP	01295	SN7402N
A6U45	1820-1197	9		IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A6U46	1820-0269	4	1	IC GATE TTL NAND QUAD 2-INP	01295	SN7403N
A6U47	1810-0307	0		NETWORK-CNDCT MODULE DIP; 16 PINS; 0.100	28480	1810-0307
A6XU9	1200-0474	9		SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0474
A6XU17	1200-0662	7		SOCKET-IC 24-CONT DIP DIP-SLDR	28480	1200-0662
A6XU18	1200-0662	7		SOCKET-IC 24-CONT DIP DIP-SLDR	28480	1200-0662
A6XU19	1200-0662	7	1	SOCKET-IC 24-CONT DIP DIP-SLDR	28480	1200-0662
A6XU20	1200-0662	7		SOCKET-IC 24-CONT DIP DIP-SLDR	28480	1200-0662
A6XU21	1200-0662	7		SOCKET-IC 24-CONT DIP DIP-SLDR	28480	1200-0662
A6XU22	1200-0662	7		SOCKET-IC 24-CONT DIP DIP-SLDR	28480	1200-0662
A6XU23	1200-0662	7		SOCKET-IC 24-CONT DIP DIP-SLDR	28480	1200-0662
A6XU24	1200-0662	7	1	SOCKET-IC 24-CONT DIP DIP-SLDR	28480	1200-0662
A6XU26	1200-0660	5			28480	1200-0660
A6XU32	1200-0473	8	3	SOCKET-IC 16-CONT DIP DIP-SLDR	28480	1200-0473
A6XU33	1200-0473	8		SOCKET-IC 16-CONT DIP DIP-SLDR	28480	1200-0473
A6XU47	1200-0473	8		SOCKET-IC 16-CONT DIP DIP-SLDR	28480	1200-0473
A9	01610-66541	8	2	DISPLAY/DRIVER ASSEMBLY	28480	01610-66541
A9C1	0160-3622	8	11	CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C2	0180-0049	9		CAPACITOR-FXD 20UF+75-10% 50VDC AL	56289	30D206G050CC2
A9C3	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C4	0180-0091	1		CAPACITOR-FXD 10UF+50-10% 100VDC AL	56289	30D106F100DC2
A9C5	0180-0058	0		CAPACITOR-FXD 50UF+75-10% 25VDC AL	56289	30D506G025CC2
A9C6	0180-0141	2	1	CAPACITOR-FXD 50UF+75-10% 50VDC AL	56289	30D506G050DD2
A9C7	0180-1747	6		CAPACITOR-FXD 150UF+20% 15VDC TA	56289	150D157X0015
A9C8	0160-3448	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3448
A9C9	0180-0058	0		CAPACITOR-FXD 50UF+75-10% 25VDC AL	56289	30D506G025CC2
A9C10	0160-4455	7		CAPACITOR-FXD 10UF +-10% 50VDC MET-POLYC	28480	0160-4455
A9C11	0160-2218	6	20	CAPACITOR-FXD 1000PF +-5% 300VDC MICA	28480	0160-2218
A9C12	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A9C13	0160-4609	3		CAPACITOR-FXD 4700PF +-5% 1KVDC CER	28480	0160-4609
A9C14	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A9C15	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C16	0160-2218	6	1	CAPACITOR-FXD 1000PF +-5% 300VDC MICA	28480	0160-2218
A9C17	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C18	0160-4455	7		CAPACITOR-FXD 10UF +-10% 50VDC MET-POLYC	28480	0160-4455
A9C19	0160-4455	7		CAPACITOR-FXD 10UF +-10% 50VDC MET-POLYC	28480	0160-4455
A9C20	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C21	0160-2218	6	1	CAPACITOR-FXD 1000PF +-5% 300VDC MICA	28480	0160-2218
A9C22	0160-3494	2		CAPACITOR-FXD .47UF +-5% 200VDC	28480	0160-3494
A9C23	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C24	0180-0059	1		CAPACITOR-FXD 10UF+75-10% 25VDC AL	56289	30D106G025BB2
A9C25	0140-0159	8		CAPACITOR-FXD 3000PF +-2% 300VDC MICA	72136	DM19F302G0300WV1CR
A9C26	0180-0058	0	1	CAPACITOR-FXD 50UF+75-10% 25VDC AL	56289	30D506G025CC2
A9C27	0160-3448	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3448
A9C28	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A9C29	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C30	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A9C31	0160-0174	9	1	CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A9C32	0180-2210	0		CAPACITOR-FXD 2UF+50-10% 150VDC AL	56289	30D205F150BB2
A9C33	0150-0024	7		CAPACITOR-FXD .02UF +80-20% 600VDC CER	28480	0150-0024
A9C34	0150-0024	7		CAPACITOR-FXD .02UF +80-20% 600VDC CER	28480	0150-0024
A9C35	0160-4230	6		CAPACITOR-FXD .01UF +80-20% 1KVDC CER	71590	GAP-103
A9C36	0160-4230	6	1	CAPACITOR-FXD .01UF +80-20% 1KVDC CER	71590	GAP-103
A9C37	0160-4230	6		CAPACITOR-FXD .01UF +80-20% 1KVDC CER	71590	GAP-103
A9C38	0180-0059	1		CAPACITOR-FXD 10UF+75-10% 25VDC AL	56289	30D106G025BB2
A9C39	0180-0059	1		CAPACITOR-FXD 10UF+75-10% 25VDC AL	56289	30D106G025BB2
A9C40	0160-4455	7		CAPACITOR-FXD 10UF +-10% 50VDC MET-POLYC	28480	0160-4455
A9C41			2	NOT ASSIGNED		
A9C42	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C43	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C44	0160-3447	5		CAPACITOR-FXD 470PF +-10% 1KVDC CER	28480	0160-3447
A9C45	0180-0106	9		CAPACITOR-FXD 60UF+-20% 6VDC TA	56289	150D606X006B2
A9C46	0160-3622	8	1	CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9C47	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A9CR1	1901-0050	3	1	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A9CR2	1901-0787	3		DIODE-PWR RECT 600V 6A	04713	MR756
A9CR3	1901-0036	5		DIODE-HV RECT 1KV 600MA DO-29	28480	1901-0036
A9CR4	1901-0490	5		DIODE-HV RECT 3KV 250MA	28480	1901-0490
A9CR5	1901-0036	5		DIODE-HV RECT 1KV 600MA DO-29	28480	1901-0036

See introduction to this section for ordering information

*Indicates factory selected value

Table 7-2. Replacement for Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A9CR6	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A9CR7	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A9CR8	1901-0787	3		DIODE-PWR RECT 600V 6A	04713	MR756
A9DS1	2140-0013	5	1	LAMP-GLOW 5AB-A 70/57VDC 300UA T-2-BULB	0046G	5AB(NE-23)
A9E1	0340-0614	4	18	INSULATOR-XSTR ALUMINUM HD-ANDZ	28480	0340-0614
A9H1	2360-0121	2	6	SCREW-MACH 6-32 .5-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A9H2	2360-0203	1	5	SCREW-MACH 6-32 .625-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A9H3	2420-0002	6	1	NUT-HEX-DBL-CHAM 6-32-THD .109-IN-THK	28480	2420-0002
A9H4	2190-0909	3	9	WASHER-LK INTL T NO. 6 .146-IN-ID	28480	2190-0909
A9H5	0380-0342	9	4	STANDOFF-RVT-ON .125-IN-LG 6-32THD	00000	ORDER BY DESCRIPTION
A9L1	9100-3139	5	4	COIL 75UH 15% .5DX.875LG-NOM	28480	9100-3139
A9L2	9140-0111	1	1	COIL-MLD 3.3UH 10% Q=33 .155DX.375LG-NOM	28480	9140-0111
A9L3	9100-3139	5		COIL 75UH 15% .5DX.875LG-NOM	28480	9100-3139
A9L4	9100-3931	5	2	COIL 700UH .6DX1.437LG-NOM	28480	9100-3931
A9L5	9100-3931	5		COIL 700UH .6DX1.437LG-NOM	28480	9100-3931
A9L6	9100-3139	5		COIL 75UH 15% .5DX.875LG-NOM	28480	9100-3139
A9L7	9100-3139	5		COIL 75UH 15% .5DX.875LG-NOM	28480	9100-3139
A9MP1	1205-0320	4	1		28480	1205-0320
A9MP2	1205-0242	9	1	HEAT SINK SGL TO-3-CS	28480	1205-0242
A9MP3	1205-0258	7	1	THERMAL LINK PLSTC-PWR-PKG	28480	1205-0258
A9MP4	7120-6264	3	2	LABEL, WARNING	28480	7120-6264
A9P2	1251-3198	7	1	CONNECTOR 15-PIN M POST TYPE	28480	1251-3198
A9Q1	1854-0624	6	1	TRANSISTOR NPN 2N6308 SI TO-3 PD=125W	04713	2N6308
A9Q2	1854-0778	1	1	TRANSISTOR NPN SI TO-3	28480	1854-0778
A9Q3	1853-0334	3	2	TRANSISTOR PNP SI DARL PD=70W FT=1MHZ	04713	MJE1090
A9Q4	1854-0215	1	10	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A9Q5	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A9Q6	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A9Q7	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A9Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A9Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A9Q10	1853-0086	2	1	TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A9Q11	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A9Q12	1854-0691	7	1	TRANSISTOR NPN SI TO-92 PD=350MW	04713	MPS A18
A9Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A9Q14	1854-0320	9	1	TRANSISTOR NPN SI PD=83.5W FT=4MHZ	28480	1854-0320
A9Q15	1853-0251	3	1	TRANSISTOR PNP SI PD=90W FT=2MHZ	28480	1853-0251
A9R1	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A9R2	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A9R3	0757-0401	0	11	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A9R4	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A9R5	2100-3351	6	2	RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A9R6	0757-0408	7		RESISTOR 243 1% .125W F TC=0+-100	24546	C4-1/8-T0-243R-F
A9R7	2100-3351	6		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A9R8	0757-0284	7	9	RESISTOR 150 1% .125W F TC=0+-100	24546	C4-1/8-T0-151-F
A9R9	0757-0408	7		RESISTOR 243 1% .125W F TC=0+-100	24546	C4-1/8-T0-243R-F
A9R10	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A9R11	0757-0446	3	3	RESISTOR 15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1502-F
A9R12	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A9R13	0683-1015	7	1	RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A9R14	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A9R15	0757-0441	8	1	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A9R16	0757-0289	2	2	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A9R17	0812-0022	9	1	RESISTOR .56 10% 3W PW TC=0+-90	91637	CW281-3-T2-56/100-K
A9R18	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A9R19	0698-3449	6	2	RESISTOR 28.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2872-F
A9R20	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A9R21	0757-0424	7	3	RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1101-F
A9R22	0757-0424	7		RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1101-F
A9R23	0757-0424	7		RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1101-F
A9R24	0757-0446	3		RESISTOR 15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1502-F
A9R25	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A9R26	0757-0445	2	1	RESISTOR 13K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1302-F
A9R27	2100-3207	1	2	RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A9R28	0757-0444	1	4	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A9R29	0757-0458	7	5	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A9R30	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A9R31	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A9R32	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A9R33	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A9R34	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A9R35	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F

See introduction to this section for ordering information

*Indicates factory selected value

Table 7-2. Replacement for Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A9R36	0757-0407	6	1	RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A9R37	0811-1674	7		RESISTOR 4.7 5% 2W PW TC=0+-400	75042	BWH2-4R7-J
A9R38	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A9R39	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1213-F
A9R40	0757-0430	5		RESISTOR 2.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2211-F
A9R41	0757-0420	3	2	RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A9R42	2100-3352	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A9R43	0698-0098	5		RESISTOR 4.51K 1% .125W F TC=0+-100	03888	PME55-1/8-T0-4511-F
A9R44	0757-0273	4		RESISTOR 3.01K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3011-F
A9R45	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A9R46	0757-0958	2	1	RESISTOR 27K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2702-G
A9R47	0698-6426	5		RESISTOR 213K 1% .125W F TC=0+-100	28480	0698-6426
A9R48	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A9R49	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A9R50	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A9R51	0757-0401	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A9R52	2100-3355	0		RESISTOR-TRMR 100K 10% C SIDE-ADJ 1-TRN	28480	2100-3355
A9R53	0757-0474	7		RESISTOR 243K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2433-F
A9R54	0698-7832	9		RESISTOR 909K 1% .125W F TC=0+-100	28480	0698-7832
A9R55	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A9R56	0757-0444	1	2	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A9R57	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A9R58	0757-0944	6		RESISTOR 6.8K 2% .125W F TC=0+-100	24546	C4-1/8-T0-6801-G
A9R59	0757-0944	6		RESISTOR 6.8K 2% .125W F TC=0+-100	24546	C4-1/8-T0-6801-G
A9R60	0812-0066	1		RESISTOR .33 5% 2W PW TC=0+-800	75042	BWH2-33/100-J
A9R61	0812-0066	1	2	RESISTOR .33 5% 2W PW TC=0+-800	75042	BWH2-33/100-J
A9R62	0757-0198	2		RESISTOR 100 1% .5W F TC=0+-100	28480	0757-0198
A9R63	0812-0045	6		RESISTOR .15 5% 3W PW TC=0+-90	28480	0812-0045
A9R64	0757-0198	2		RESISTOR 100 1% .5W F TC=0+-100	28480	0757-0198
A9R65	0683-5105	4		RESISTOR 51 5% .25W FC TC=-400/+500	01121	CB5105
A9R66	0683-5105	4	1	RESISTOR 51 5% .25W FC TC=-400/+500	01121	CB5105
A9R67	0683-5105	4		RESISTOR 51 5% .25W FC TC=-400/+500	01121	CB5105
A9R68	0757-0416	1		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A9R69	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A9R70	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A9R71	2100-3358	3	2	RESISTOR-TRMR 1M 20% C SIDE-ADJ 1-TRN	28480	2100-3358
A9R72	2100-3358	3		RESISTOR-TRMR 1M 20% C SIDE-ADJ 1-TRN	28480	2100-3358
A9R73	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A9R74	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
A9R75	0684-1021	7		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
A9R76	0684-1021	7	1	RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
A9R77	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A9R78	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A9R79	0760-0014	8		RESISTOR 1K 2% 1W MO TC=0+-200	28480	0760-0014
A9R80	2100-3207	1		RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A9R81	0757-0280	3	3	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A9R82	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A9R83	0698-0093	0		RESISTOR 10 5% 1W MO TC=0+-200	28480	0698-0093
A9R84	0698-3200	7		RESISTOR 8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8001-F
A9T1	5061-1228	1	1	TRANSFORMER, DRIVE	28480	5061-1228
A9TP1	0360-0535	0	0	TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A9TP2	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A9TP3	1251-2229	3	0	CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	28480	1251-2229
A9TP4	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A9TP5	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A9TP6	1251-4045	5		SOCKET-GROUND	28480	1251-4045
A9U1	1820-0196	6	1	IC 723 V RGLTR T0-100	04713	MC1723CG
A9U2	1820-0261	6		IC MV TTL MONOSTBL	01295	SN74121N
A9U3	1820-1796	4		IC DRVR TTL DUAL 2-INP	27014	DS3611N
A9U4	1820-1416	5		IC SCHMITT-TRIG TTL LS INV HEX 1-INP	01295	SN74LS14N
A9U5	1820-0668	7		IC BFR TTL NON-INV HEX 1-INP	01295	SN7407N
A9U6	1826-0254	9	2	OP AMP GP 8-DIP-P	04713	MC1741SCP1
A9U7	1826-0254	9		OP AMP GP 8-DIP-P	04713	MC1741SCP1
A9VR1	1902-0593	1	6	DIODE-ZNR 43.2V 10% DO-15 PD=1W TC=+.08%	28480	1902-0593
A9VR2	1902-0668	1		DIODE-ZNR 200V 5% DO-15 PD=1W TC=+.088%	28480	1902-0668
A9VR3	1902-0668	1		DIODE-ZNR 200V 5% DO-15 PD=1W TC=+.088%	28480	1902-0668
A9VR4	1902-0668	1		DIODE-ZNR 200V 5% DO-15 PD=1W TC=+.088%	28480	1902-0668
A9VR5	1902-0041	4		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=+.009%	28480	1902-0041
A9VR6	1902-0041	4	1	DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=+.009%	28480	1902-0041
A9VR7	1902-0668	1		DIODE-ZNR 200V 5% DO-15 PD=1W TC=+.088%	28480	1902-0668
A9VR8	1902-0668	1		DIODE-ZNR 200V 5% DO-15 PD=1W TC=+.088%	28480	1902-0668
A9VR9	1902-0668	1		DIODE-ZNR 200V 5% DO-15 PD=1W TC=+.088%	28480	1902-0668
A9VR10	1902-0026	5		DIODE-ZNR 36.5V 10% DO-7 PD=.4W	28480	1902-0026

See introduction to this section for ordering information

*Indicates factory selected value

ADJUSTMENTS

5-15. ΔT ADJUSTMENT.

REFERENCE:

Figure 5-4 and Service Sheet 6C.

DESCRIPTION:

This adjustment sets clock probe timing for the 1610B self test.

PROCEDURE:

- a. Disconnect A16W1 from A6P2 (probe driver connector).
- b. Connect channel A of oscilloscope to A6P2, pin 3 and channel B to A6P2, pin 1. Set oscilloscope to 0.1 V, dc coupling, dc triggering on channel A, and 10 ns/div.
- c. Reconnect A16W1 to A6P2 and press SELF-TEST button on 1610B rear panel.
- d. Press FIELD SELECT key one time to enable keyboard test.

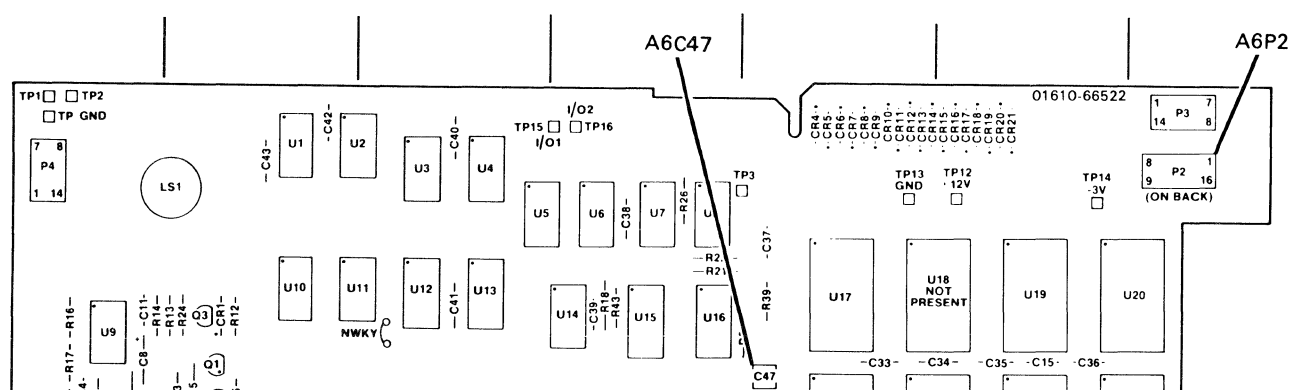


Figure 5-6. ΔT Adjustment Location

- f. Adjust A6C47 for ≥ 5 ns interval between rising edge of channel A waveform (A6P2, pin 3) and falling edge of channel B waveform (A6P2, pin 1); see figure 5-5.

NOTE

The repetition rate of the signal at A6P2, pin 3 is very low. A storage oscilloscope or a viewing hood on a standard oscilloscope may be required to observe the signal edge.

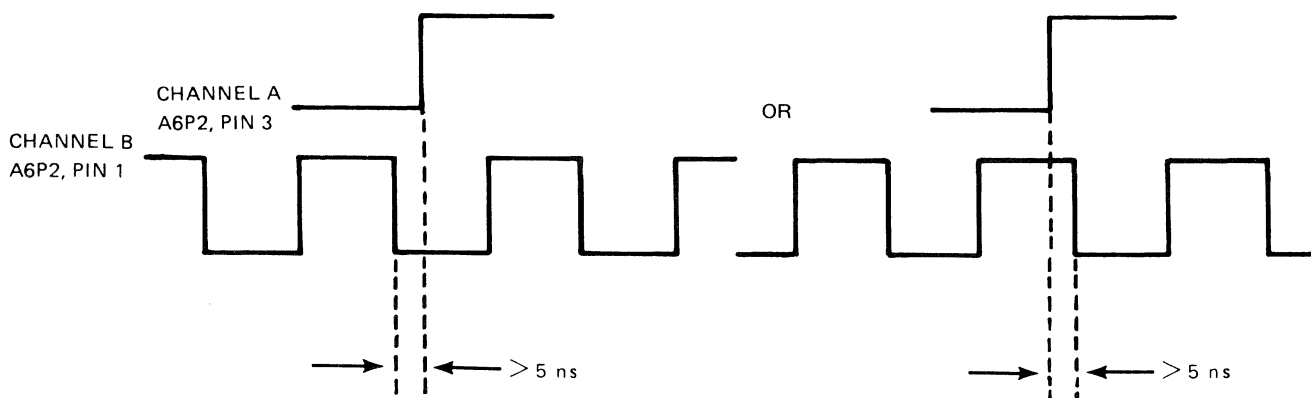
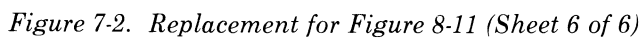
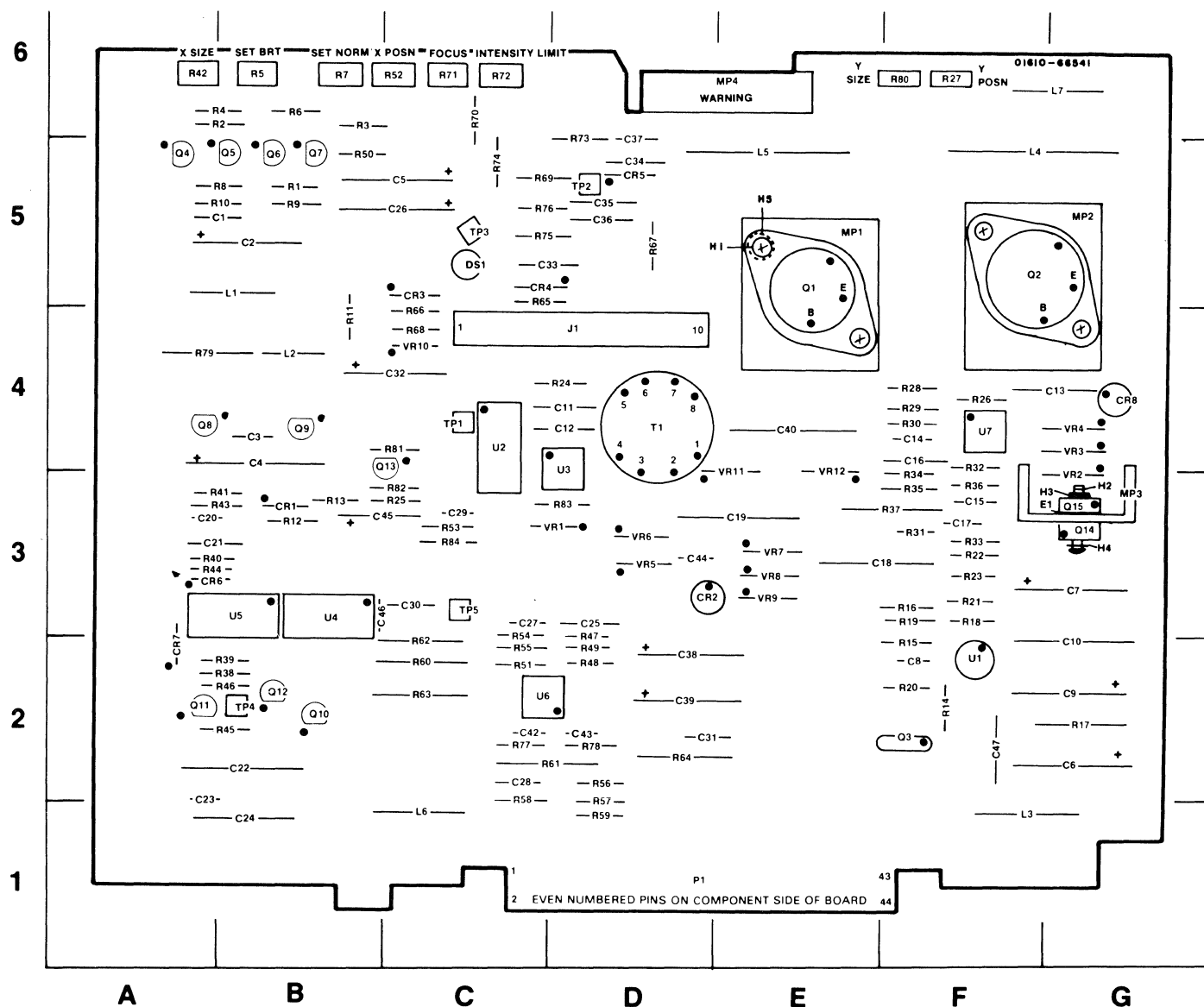


Figure 5-7. ΔT Adjust Waveform

Figure 7-1. Replacement for Paragraph 5-15

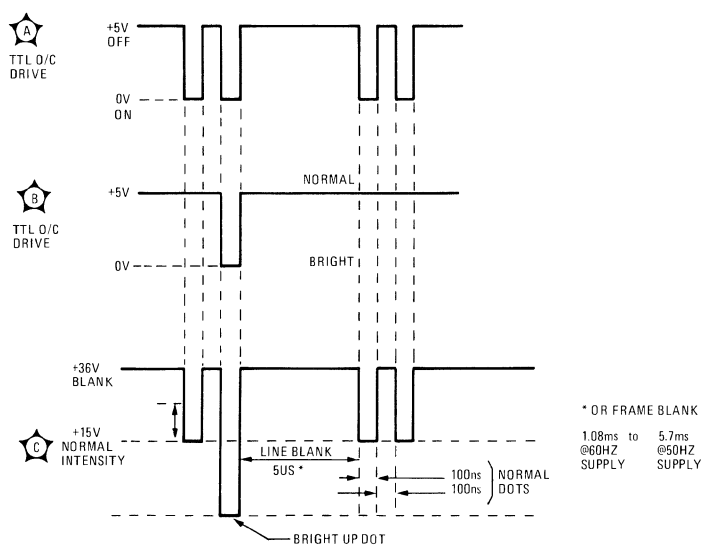
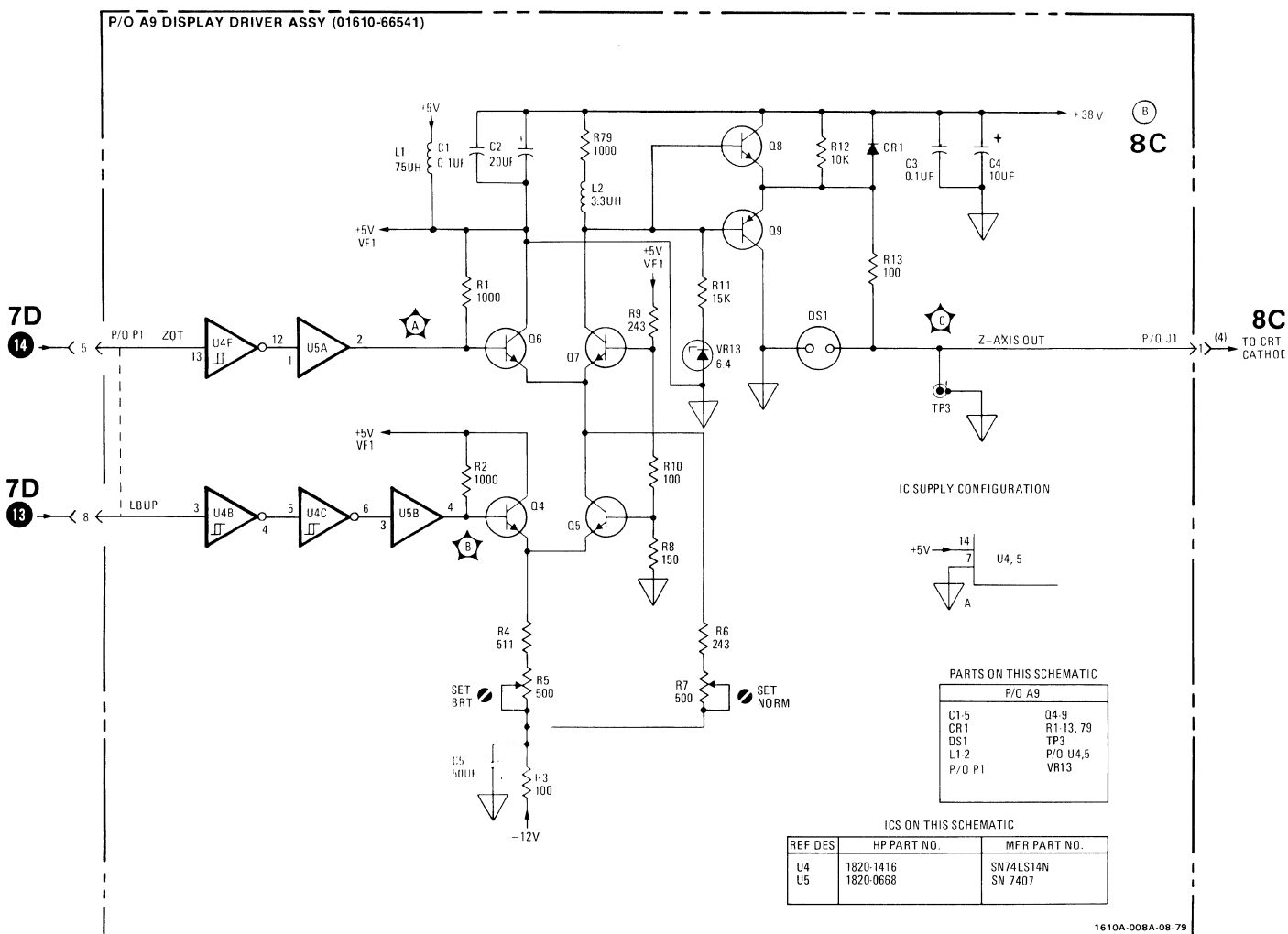




A9 Component Locations (01610-66541)

REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	B-5	C26	C-5	CR5	D-5	Q3	F-2	R12	B-3	R37	F-3	R62	C-2	TP1	C-4
C2	B-5	C27	C-3	CR6	B-3	Q3	F-2	R13	B-3	R38	B-2	R63	C-2	TP2	D-5
C3	B-4	C28	C-2	CR7	A-2	Q4	A-5	R14	F-2	R39	B-2	R64	D-2	TP3	C-5
C4	B-4	C29	C-3	CR8	G-4	Q5	B-5	R15	F-2	R40	B-3	R65	C-5	TP4	B-2
C5	C-5	C30	C-3	DS1	C-5	Q6	B-5	R16	F-3	R41	B-3	R66	C-4	TP5	C-3
C6	G-2	C31	D-2	E-1	G-3	Q7	B-5	R17	G-2	R42	A-6	R67	D-5	U1	F-2
C7	G-3	C32	C-4	H1	E-5	Q8	A-4	R18	F-3	R43	B-3	R68	C-4	U2	C-4
C8	F-2	C33	C-5	H2	G-3	Q9	B-4	R19	F-3	R44	B-3	R69	C-5	U3	D-3
C9	G-2	C34	D-5	H3	G-3	Q10	B-2	R20	F-2	R45	B-2	R70	C-6	U4	B-3
C10	G-2	C35	D-5	H4	G-3	Q11	A-2	R21	F-3	R46	B-2	R71	C-6	U5	B-3
C11	D-4	C36	D-5	H5	E-5	Q12	B-2	R22	F-3	R47	D-2	R72	C-6	U6	C-2
C12	D-4	C37	D-5	J1	D-4	Q13	C-4	R23	F-3	R48	D-2	R73	D-5	U7	F-4
C13	G-4	C38	D-2	L1	B-5	Q14	G-3	R24	D-4	R49	D-2	R74	C-5	VR1	D-3
C14	F-4	C39	D-2	L2	B-4	Q15	G-3	R25	C-3	R50	B-5	R75	C-5	VR2	G-3
C15	F-3	C40	E-4	L3	F-1	R1	B-5	R26	F-4	R51	C-2	R76	C-5	VR3	G-4
C16	F-4	C42	C-2	L4	F-5	R2	B-6	R27	F-6	R52	C-6	R77	C-2	VR4	G-4
C17	F-3	C43	D-2	L5	E-5	R3	B-6	R28	F-4	R53	C-3	R78	D-2	VR5	L-3
C18	F-3	C44	D-3	L6	C-1	R4	B-6	R29	F-4	R54	C-3	R79	A-4	VR6	D-3
C19	E-3	C45	C-3	L7	G-6	R5	B-6	R30	F-4	R55	C-2	R80	F-6	VR7	E-3
C20	B-3	C46	B-3	MP1	E-5	R6	B-6	R31	F-3	R56	D-2	R81	C-4	VR8	E-3
C21	B-3	C47	F-2	MP2	G-5	R7	B-6	R32	F-4	R57	D-1	R82	C-3	VR9	E-3
C22	B-2	CR1	B-3	MP3	G-3	R8	B-5	R33	F-3	R58	C-2	R83	D-3	VR10	C-4
C23	A-2	CR2	D-3	MP4	E-6	R9	B-5	R34	F-3	R59	D-1	R84	C-3	VR11	E-4
C24	B-1	CR3	C-5	Q1	E-5	R10	B-5	R35	F-3	R60	C-2	T1	D-4	VR12	E-4
C25	D-3	CR4	C-5	Q2	F-5	R11	B-4	R36	F-3	R61	D-2				

Figure 7-3. Replacement for A9 Component Locations



8A

Figure 7-4. Replacement for Figure 8-13 (Sheet 2 of 6)

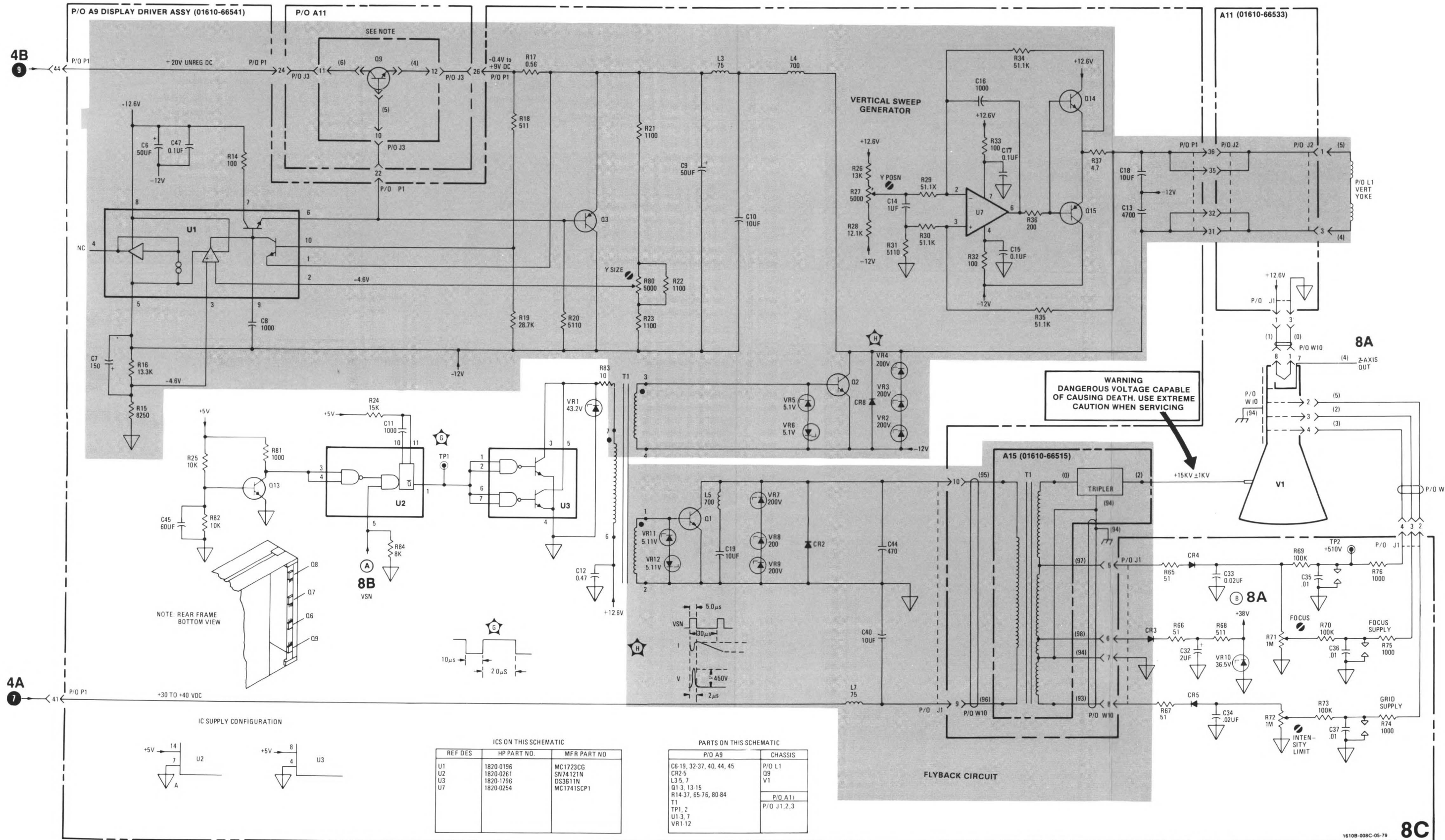


Figure 7-5.
Replacement for Figure 8-13 (Sheet 6 of 6)
7-13/(7-14 blank)

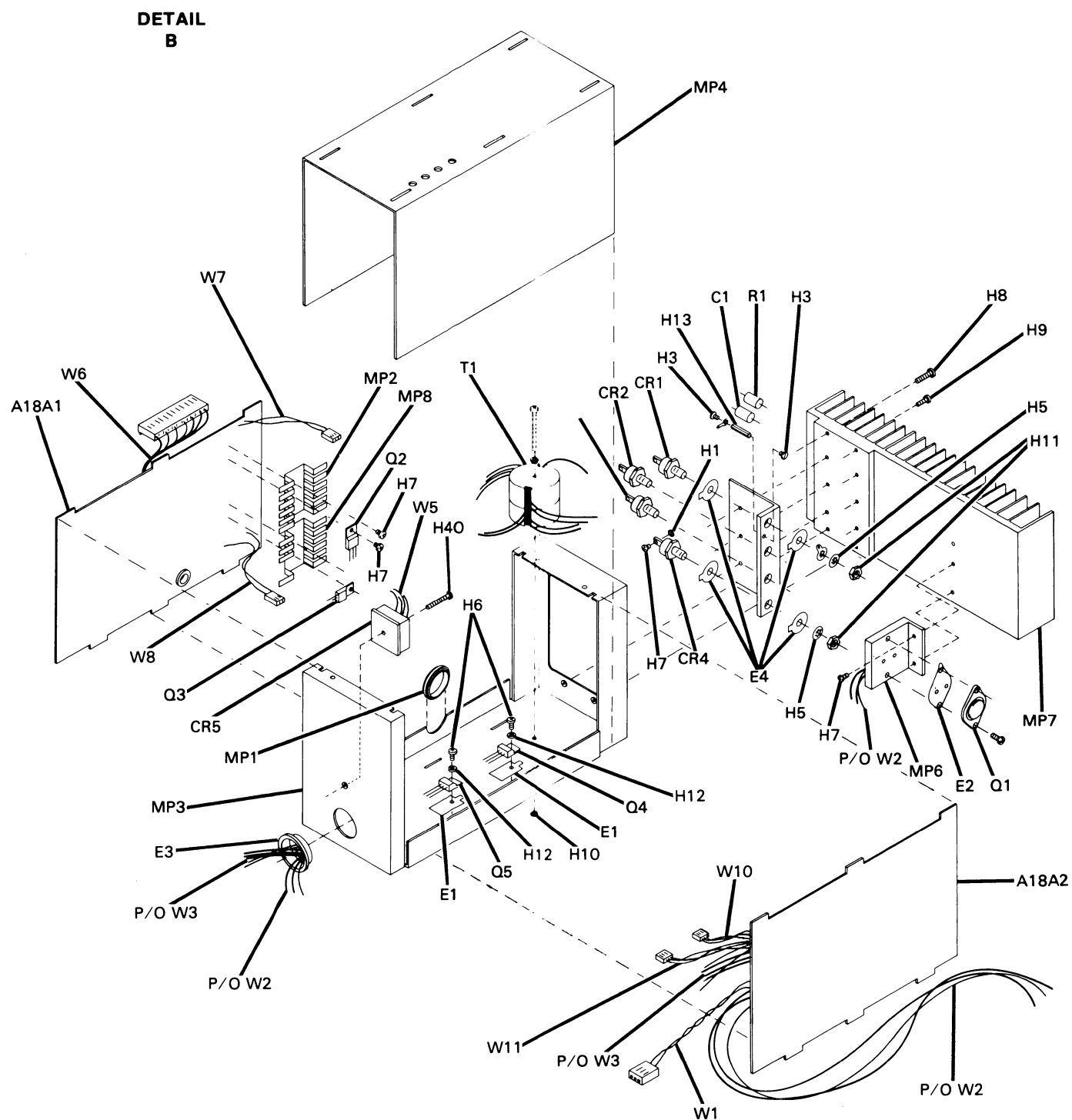


Figure 7-6.
Replacement for Figure 6-1 (Sheet 2 of 2)
7-15

SERVICE SHEET 3

PRINCIPLES OF OPERATION

Switching Power Supply Description. The switching supply provides +5 V and -5.2 V to the rest of the instrument. The +5 V supply is a true pulse-width modulated switching supply that operates from 25 to 30 kHz while the -5.2 V supply is actually a linear regulator whose unregulated dc input comes from the secondary winding of the +5 V switching transformer. Both supplies have fold-back current limiting and over-voltage crowbar protection circuitry. The +12 volts INT and -12 volts INT are developed for use throughout the switching supply so it can be independent from other supplies in the 1610B. The two internal supplies are developed through T3 whose secondary is full-wave rectified and applied to two, three-terminal regulators, U1 and U2. The outputs of these regulators provide the +12 volt internal and -12 volt internal supplies. A18RV1 and A18RV2 are voltage variable resistors which suppress high-voltage transients and static over-voltage conditions from the ac line input.

The +5 volt pulse-width modulated switching supply operates as follows: the ac line voltage is rectified to provide a ±160 V which is alternately switched across the primary of switching transformer A18T2 by A18Q2 and A18Q3. The secondary of the transformer is rectified by CR2 and CR3 and filtered by A18A2L2, and A18A2C17; this is the actual +5 V output. It is fed back to sensed by the pulse width modulation control circuitry. The pulse width (duty cycle) of the switching transistors is then increased if the voltage is too low or decreased if the voltage is too high.

The ac line voltage is applied to bridge rectifier CR5. This rectifier along with a A18A1C1 and C2 are either connected as a voltage doubler for 110 V operation or as a fullwave bridge rectifier for 220 V operation. Thermal resistor A18A1RT1 is used to reduce high surge currents when power is first applied and A18C1 and C2 are charging.

Pulse-width modulation control circuitry is contained in A18A2U1 which contains such functional components as an oscillator, reference amplifier voltage-sense amplifier, current-limit amplifier, and a dead-time control comparator. The oscillator runs at a fixed frequency (set by R23 and C14), so the oscillator will run between 25 and 30 kHz. The oscillator produces a sawtooth waveform on U1 pin 5 that is used in pulse-width modulation generation.

The reference voltage output (approx 5 Vdc) is used by the +5 volt supply, the remote shutdown, and the crowbar circuitry. The voltage sense amplifier senses the difference between the reference voltage and the present value of the +5 V supply. This voltage is amplified and applied to the comparator where it is compared with the

sawtooth waveform from the oscillator. Depending on the value of the output of the voltage sense amplifier, the output of the comparator will be a fixed pulse width signal. This signal is applied to an AND gate along with the output of the dead-time control comparator. The dead-time control comparator provides a certain amount of time when neither of the switching transistors are on, i.e., dead time. This dead time is determined by comparing a fixed voltage developed through a current source which is fed into R16 and the voltage sawtooth waveform coming from the oscillator. If the remote shutdown is activated, Q2 will turn on and provide a high positive voltage on the input of the dead-time controller. This yields 100% dead time, and the supply will be shut down.

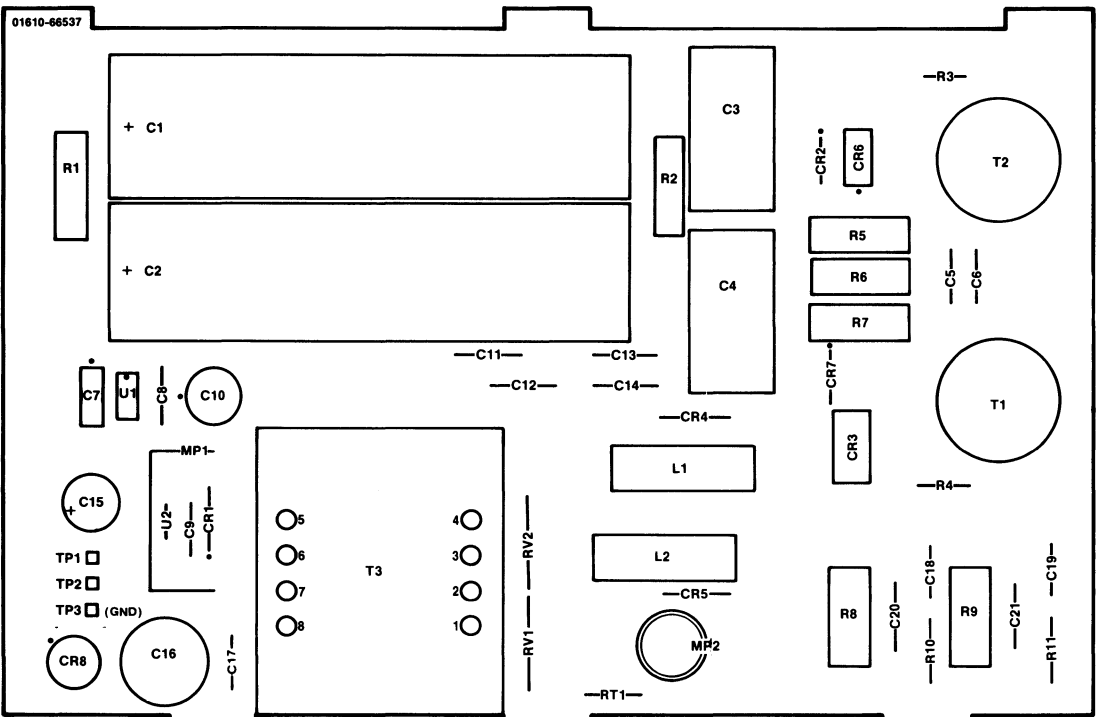
The current sense amplifier senses the voltage drop across current sensing resistor R45. If the voltage drop across R45 becomes too large, the current limit amplifier output voltage will override the output of the voltage sense amplifier and the pulse width of the signal from the comparator will be decreased proportionally. The output of the AND gate in U1 clocks a T flip-flop and is also applied to two AND gates which drive output buffer transistors. The T flip-flop alternately selects one of the outputs to be active. These signals are applied to two driver transistor stages contained in U2 which drive the primaries of two isolation transformers. The outputs of these transformers drive the bases of two transistors which alternately switch the plus and minus 160 volts dc across the primary of A18T2. The +5 volt crowbar circuit continuously monitors the +5 volt output. If this output goes above approximately +6.3 volts, the crowbar circuit will trip and SCR A18Q4 will turn on, thus shorting the output of the supply to ground. When an overvoltage occurs, the input on pin 2 of U5 will be above the 2.6 volt level. This will turn the transistor off and allow the current source to start charging C10. When C10 charges above the 2.6 volt level, the SCR will be turned on; it will also be turned on if the input on pin 5 is ever at a TTL high, which occurs if the -5.2 volt crowbar is ever activated.

The output of the switching transformer secondary is rectified by CR1 and CR4 to provide the dc input to the -5.2 V regulator. This rectified output is filtered by L3 and C18 which produce approximately -10 V dc. The -5.2 V regulator is contained in U3. The reference voltage is developed through an internal current source (set by resistor R31) and is applied through R29 and R49. R49 is adjusted to give a correct voltage drop to yield an output voltage of -5.2 volts.

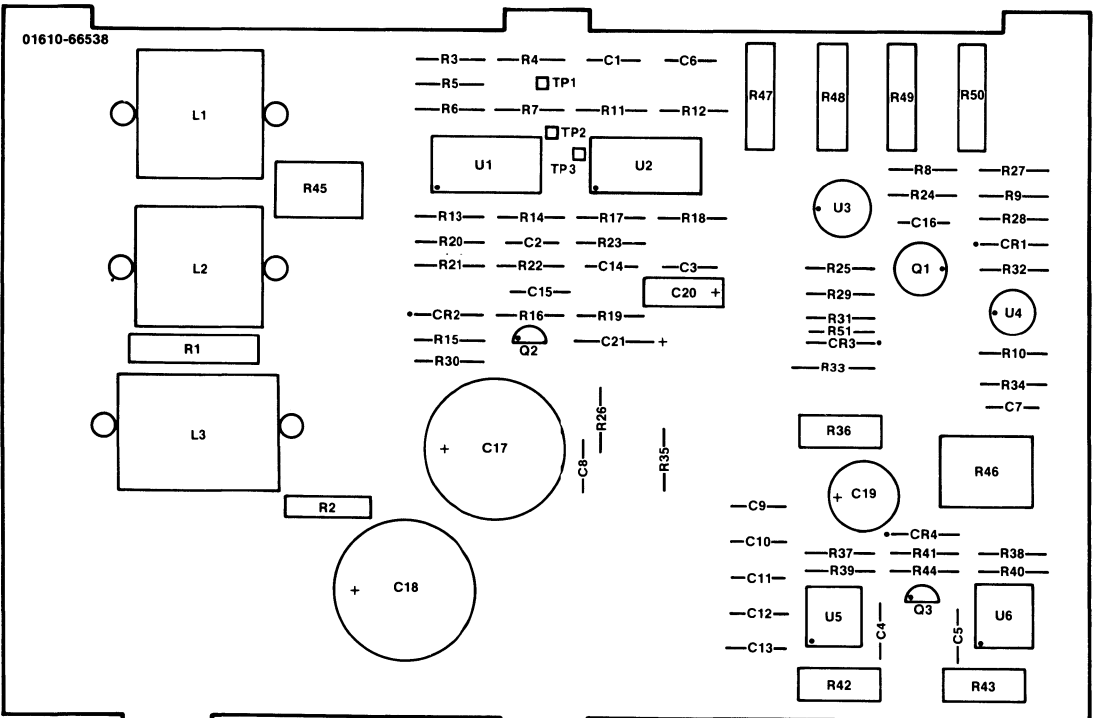
Current limit amplifier U4 amplifies the voltage drop across current sensing resistor R46. If the voltage drop becomes too large, the output of U4 will go positive and CR1 will turn on, thus folding back the power supply. The -5.2 volt crowbar circuit works essentially the same as the +5 volt crowbar circuit.

Switching Power Supply Troubleshooting. The +5 volt pulse width modulated section of the switching power supply must be operational before the -5.2 volts power supply will operate. Therefore, the +5 volts pulse width modulated switching supply must be checked and repaired first. The pulse width modulation control circuitry may be tested without applying any ac voltage. Instead, a +15 volt supply should be applied between Test Point 3 (ground) and Test Point 1. This should allow the +12 volt internal supply and the control circuitry to operate. With this voltage applied, waveforms A through G can be checked. When these waveforms are correct, the ac line should be connected to the supply through a Variac. With the +15 volt supply still applied between A18A1TP3 and TP1, the line voltage should be gradually increased while monitoring the line current. If excessively high current does occur, waveform H should be monitored. If this waveform is excessively large, a short on the secondary of A18T2 should be expected. If this waveform is not excessively large, the input line rectification circuitry should be checked. When the +5 volt portion of the switching supply is fully operational, the -5.2 volt supply may then be checked.

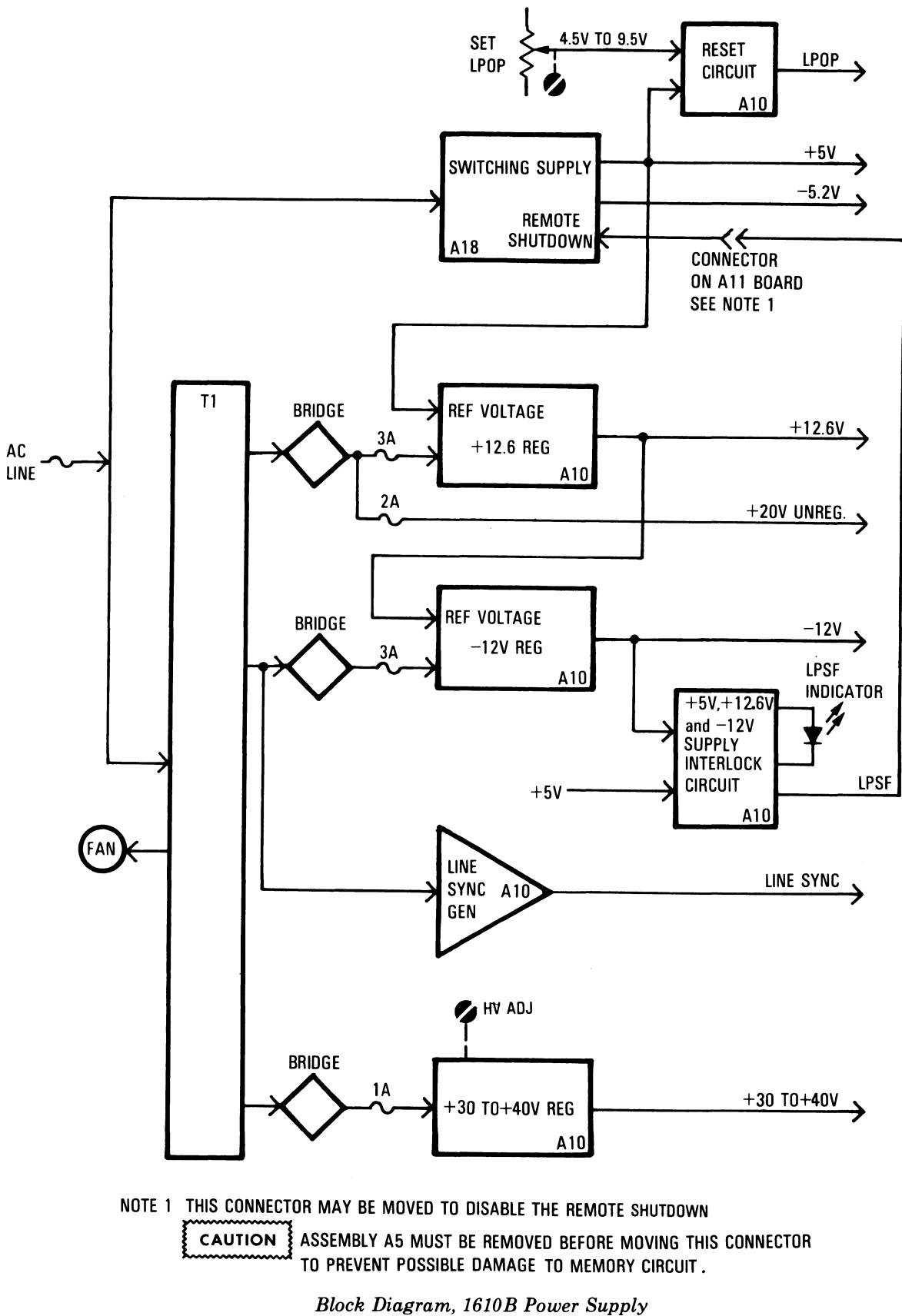
Certain power supply functions may be disabled to help in problem isolation. When disabling these various circuits, the power supply outputs should be disconnected from the 1610B to prevent damage to certain components. Both power supplies may be brought up without an external load. Various circuit functions may be disabled as follows: the +5 volt crowbar and -5.2 volt crowbar circuits may be disabled by disconnecting the cable that goes to A18Q4 and Q5 respectively; the remote shutdown feature may be disabled by lifting one end of A18A2R19, the +5 volt current limit may be disabled by lifting one end of both A18A2R5 and A18A2R3. The -5 volt current limiting may be disabled by lifting one end of both A18A2R27 and R28.



A18A1 Component Locations (01610-66537)



A18A2 Component Locations (01610-66538)



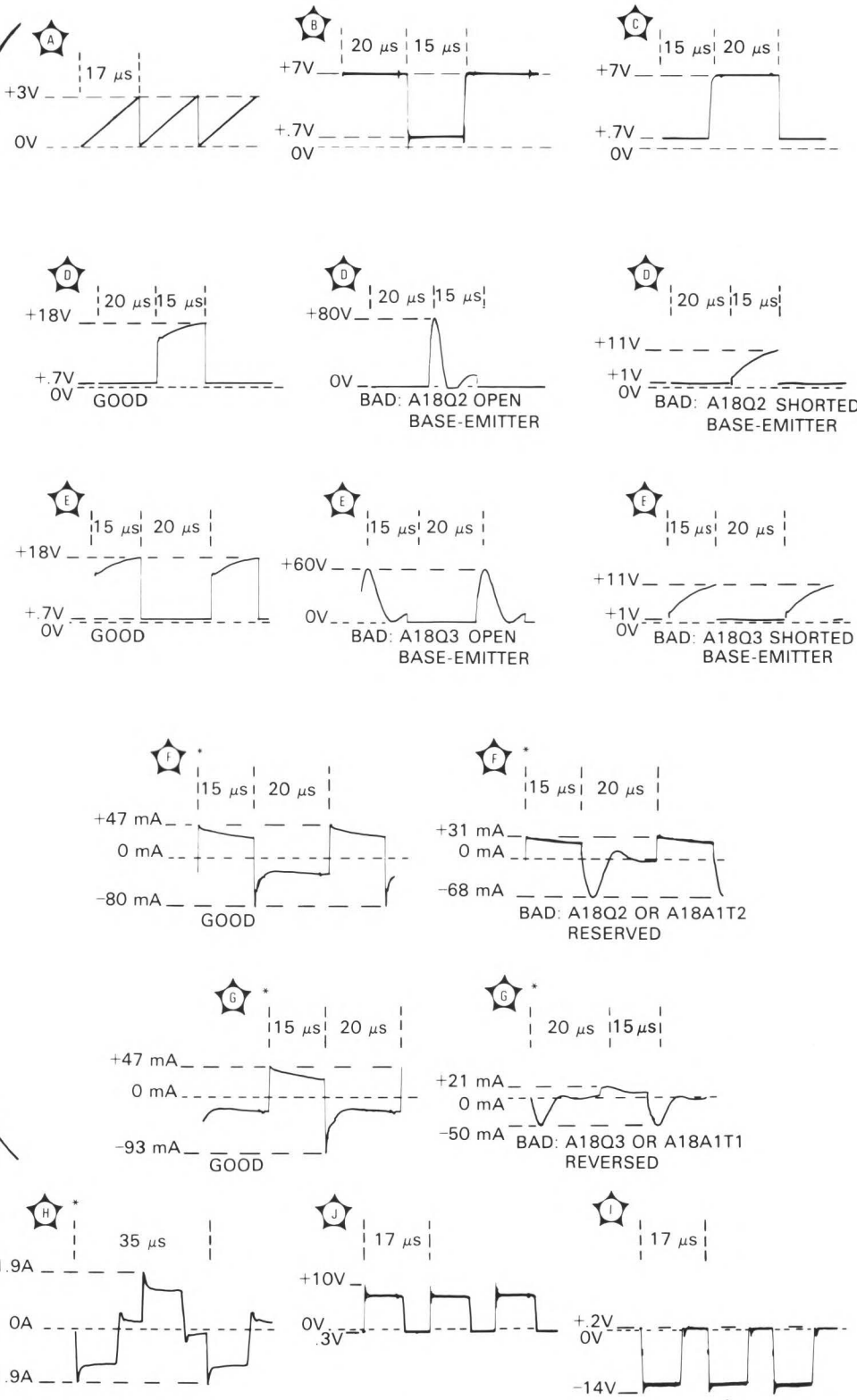
Block Diagram, 1610B Power Supply

Figure 7-7. Replacement for Figure 8-8 (Sheet 1 of 2)

TEST CONDITIONS FOR WAVEFORMS

⬠ THROUGH ⬠

- 1. NO AC POWER APPLIED.
- 2. A +15V TO +30V SUPPLY AT APPROX 200mA CONNECTED BETWEEN A18A1TP1 AND A18A1TP GND.
- 3. NO LOAD ON +5V OR -5.2V OUTPUTS.



TEST CONDITIONS FOR WAVEFORMS

⬠ THROUGH ⬠

- 1. FULL AC LINE VOLTAGE APPLIED.
- 2. +5V AND -5.2V MUST BE CONNECTED TO THE 1610B AND ALL BOARD ASSEMBLIES INSTALLED.

*NOTE: AN HP 1110A AC CURRENT PROBE MAY BE USED FOR THESE WAVEFORMS. WHEN TERMINATED INTO 50 OHMS, OUTPUT WILL YIELD 3.1 AMPS/VOLT.

Waveforms for Schematic 3

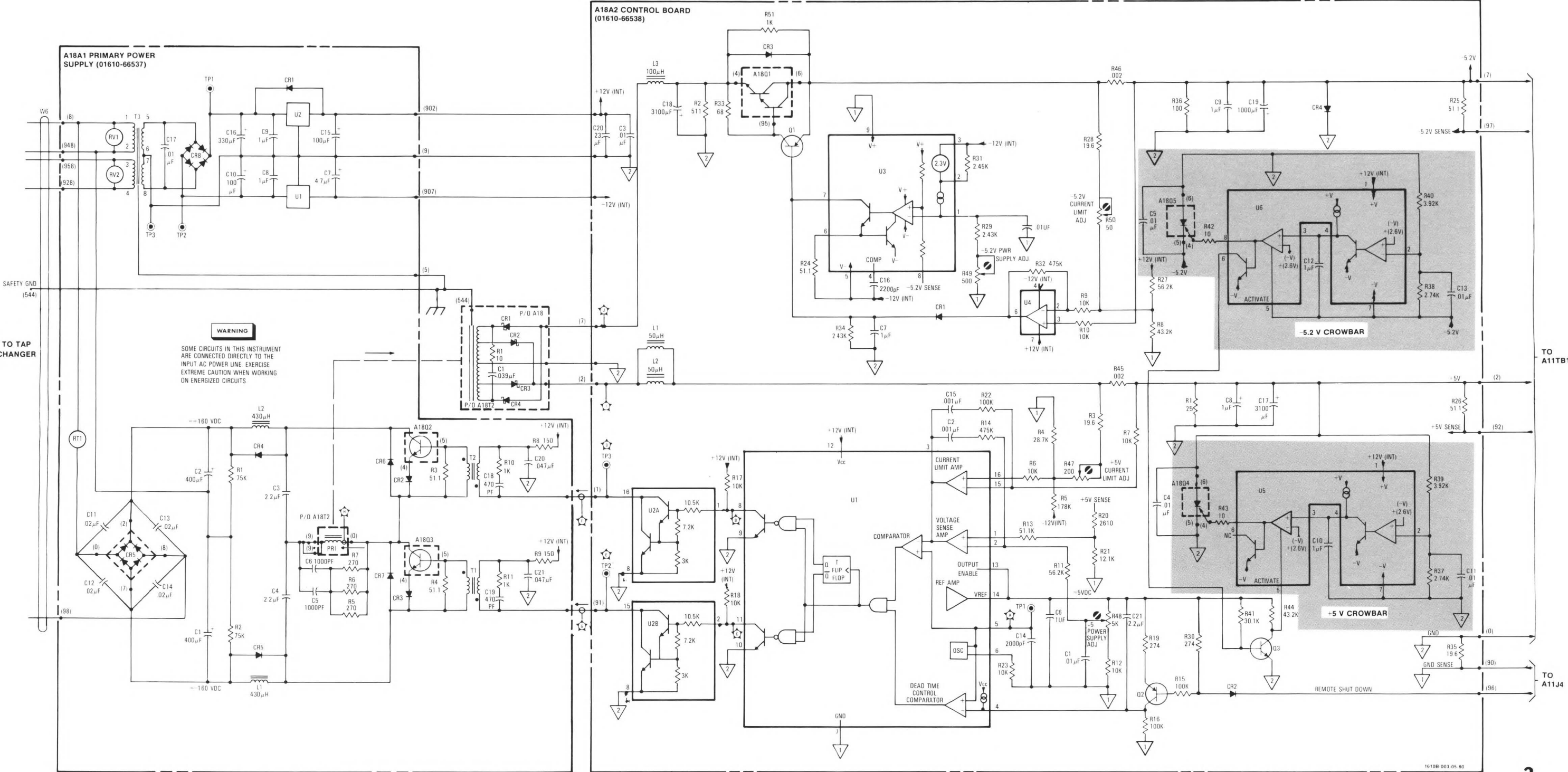


Figure 7-8.
Replacement for Figure 8-8 (Sheet 2 of 2)
7-17

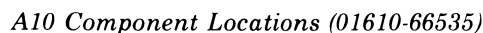
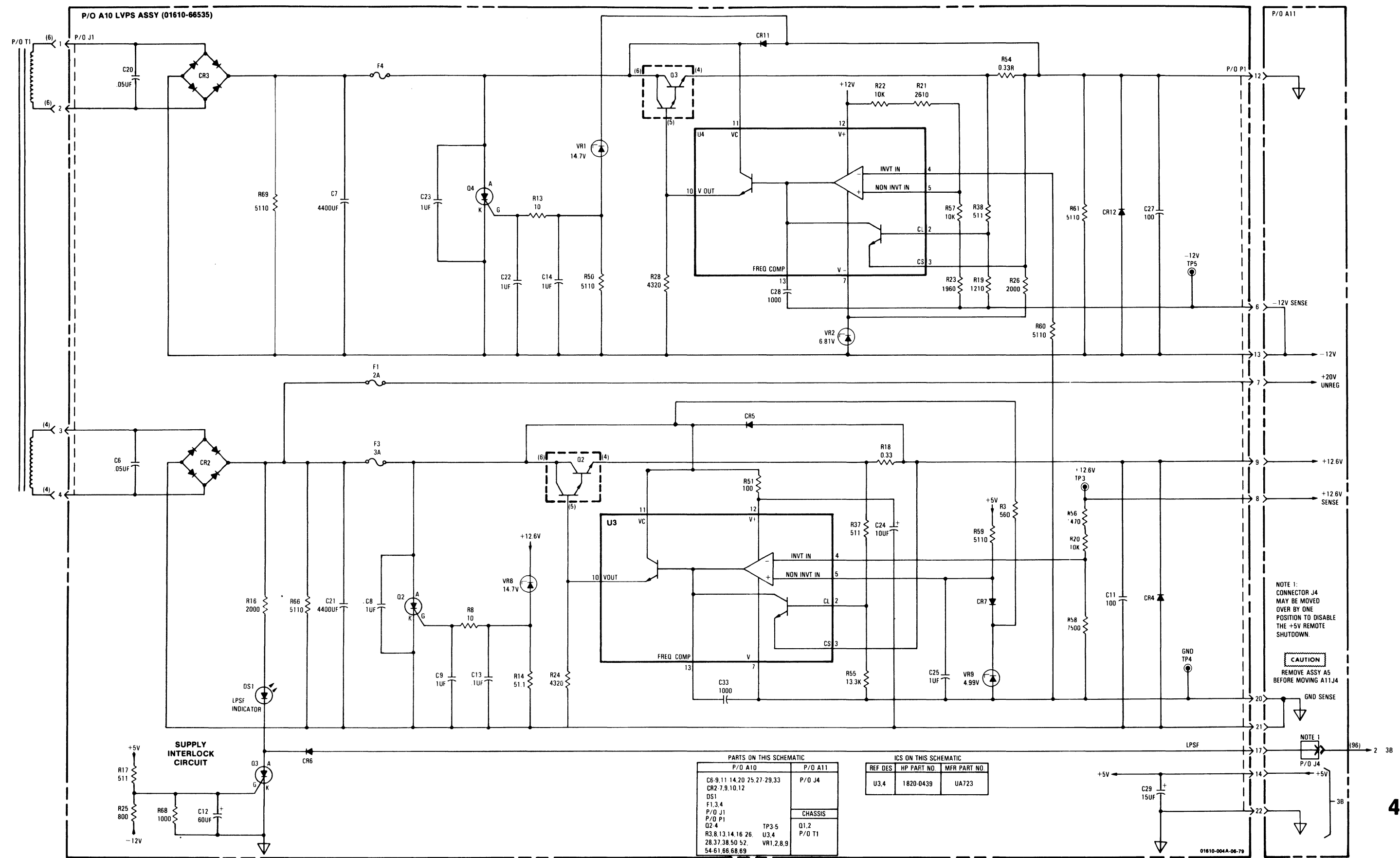
[illegible]

Figure 7-9. A10 Component Locations (01610-66535)



4A

Figure 7-10.
Replacement for Figure 8-9 (Sheet 2 of 4)
7-19

Table 8-1. 1610B Schematic Functional Breakdown

Overall	Schematic	Assembly	Display Section	Schematic	Assembly
Tap Changer	2	A14	Display Clocks	7A	A5
+5V, -5.2 V Power Supply	3	A18	Display Counters	7B	A5
-12V, +12.6 V and +20 unreg. Power Supply	4A	A10	Microprocessor/Display RAM	7C	A5
+30 - -40 V Power Supply, Line Sync Generator, Reset (LPOP) Generator	4B	A10	Alphanumeric and Graph Video Logic	7D	A5
Mother Board	1	A11	Video Drive (Z-axis)	8A	A9
System Clock	7A	A50	Horizontal Sweep	8B	A9
			Vertical Sweep and High Voltage	8C	A9
			Data Acquisition Section		
			Threshold Circuits	9A	A1
			Clock Control	9B	A1
Control and I/O Section			Internal Clock (Strobe) Generators	11A	A3
Microprocessor Clocks	6A	A6	Counter/Latches	9C	A1
Microprocessor and Program ROMs	6B	A6	Trigger Memories	10A	A2
Microprocessor/Display RAM	7C	A5	Sequential Trigger	10B	A2
Keyboard Control, Rear Panel Probe Driver Control, State/ Time Counter Reset, Beeper, Printer Interface,			Trace Only States Circuit	10C	A2
Delta Timer (Interrupt)	6C	A6	Memory Address Counters and Control, Trace Point Latch and Post Trace Point Counters	11C	A3
Keyboard	5	A12	High Speed Data Memories and State/Time Counters	11B	A3
Rear Panel Probe Driver	12	A16	Microprocessor Interface (Flags, Data, Trace Point Latch, Present Address Latch)	11D	A3

SECTION VIII

SERVICE

8-1. INTRODUCTION.

8-2. This section contains information for troubleshooting and repairing the Model 1610B Logic State Analyzer.

8-3. Block diagrams, schematics, component location figures, and other service data are provided on fold-out Service Sheets in this section to help you in servicing the 1610B.

8-4. PRINCIPLES OF OPERATION.

8-5. Basic principles of operation are provided with block diagrams at the beginning of this section. Figure 8-1 is a simplified diagram of the complete instrument. Detailed block diagrams of the four main sections of the instrument are presented in figures 8-2 thru 8-5; these diagrams are also shown (on a smaller scale) adjacent to schematics on the Service Sheets. Shaded areas indicate which portion of the diagram is contained on the related schematic.

8-6. LOGIC CONVENTION. The positive logic convention is used for logic variables and circuits within the 1610B. Positive logic convention defines a logic 1 as the more positive voltage (high) and a logic 0 as the more negative voltage (low). Integrated circuits in the 1610B are transistor-transistor-logic (TTL).

8-7. MNEMONICS. Signals in the 1610B have been assigned mnemonics that describe the active state and function of the signal line. A prefix letter (H, L, P, or N) indicates the active state of the signal, and the remaining letters indicate its function. An H prefix indicates that the function is active in the high state; an L prefix indicates that the function is active in the low state. Mnemonics with no L or H prefix should be assumed H unless a bar is over it indicating an L. For edge-controlled devices, the prefix "P" indicates that the function is active on the positive-going transition; prefix "N" means the function is active on the negative-going transition. Mnemonic functional definitions are listed alphabetically in table 8-2.

8-8. TROUBLESHOOTING.

WARNING

Read the Safety Summary at the front of this manual before troubleshooting the instrument.

8-9. The most important prerequisites for successful troubleshooting are: (1) an understanding of instrument functional operation and (2) the correct use of front-panel controls. Suspected malfunctions may be caused by improper control settings. Before troubleshooting, refer to the 1610A/B Operators Guide for an explanation of controls, connections, and general operating information, and to the Service Sheets in this section.

8-10. If trouble is suspected, visually inspect the instrument. Look for loose or burned components that might suggest a source of trouble. Verify that all circuit board connections are making good contact and are not shorting to an adjacent circuit. Attempt to complete the Performance Tests in Section IV. If no obvious trouble is found, check the instrument power-supply voltages and external line voltage before any extensive troubleshooting.

8-11. Troubleshooting should be done by sections; i.e., A5, A6, and A9 comprise the display section and can be serviced with the acquisition circuitry (A1, A2, and A3) removed.

8-12. OPERATION VERIFICATION. The 1610B self-test feature provides some diagnostic capability as well as operational verification. Refer to Section IV.

8-13. 1610B BASIC BLOCK DIAGRAM DESCRIPTION. (See figure 8-1.)

8-14. The 1610B consists of four main functional blocks: Power Supply, Control and I/O, Display, and Data Acquisition.

8-15. POWER SUPPLY. The power supply accepts ac line voltage and provides other circuits with the following dc voltages: +5 V, -5.2 V, +12.6 V, -12 V, +30 to +40 V regulated, and +20V unregulated; it also provides the LPOP and Line Sync signals. LPOP is generated whenever there is a power failure on the +5 V supply or when power is first turned on. This signal goes to the control and I/O section where it initializes the 6800 μ P (microprocessor) and I/O circuitry. Line Sync is a line-frequency squarewave that is generated to synchronize display frequency with line frequency. This prevents beating one frequency with the other which would cause the display to jitter.

Table 8-2. 1610B Mnemonics

Mnemonic	Description
A0-A11	Multiplexed address lines for μ P (microprocessor) and display RAM. Can contain either display address information or μ P address information.
ADDRESS STROBE	Complementary strobe signals that are used to select between the memory address counter outputs and the μ P address bus for addressing the high speed memory.
BD28-31	Binary Data 28-31. ECL signals from the master data latch. These signals are used either as binary data when the 1610B is gathering data or as address input to the clock slope and qualification memory when the μ P is loading memory.
BRK-C	Break Count. High on terminal occurrence of selected sequence or trace point term.
BRK-E	Break Event. High when selected sequence or trace point term occurs.
C0-C7	Column Selects 0-7. Each column select is a set of decoded uP write addresses.
CLACQ	Clear Acquisition. Loads state time counters so they are in a known state for signature analysis. Used only during trace test.
CLINT	Clear Interrupt. A decoded μ P write address used in conjunction with LAO to either clear the interrupt flip-flop in the delta timer or to clear the new key flag on the keyboard.
CLK1, CLK2	Clocks 1 and 2. Clock signals which occur whenever the qualified edge of the master clock occurs. These clock signals are used to drive the strobe generator circuits.
CLKJ	Clock J. Clock signal coming from the Clock J input of the clock probe.
CLKK	Clock K. Clock K signal from the clock probe.
CLKL	Clock L. Clock L signal from the clock probe.
CLKM	Master Clock. Master clock signal to master clock slope detector.
COUNT STROBE	Strobe signal used to clock trace point address latch and state time counters when in state mode.
CP1-CP3	Clock pulses 1-3. Synchronize clock pulses that clock state time counter circuitry.
CS STROBE	Chip select strobe. Strobe signal used to drive chip enables on high-speed memory during data acquisition write cycle.
D0-D31	Data bits 0 to 31. 32 channels of data coming from the data probes.
DA0-DA10	Display addresses 0 through 10. Address information coming from display circuitry used to address display data from display RAM. Alternately selected with microprocessor address bus for addressing the dynamic RAM.
DMC	Delayed Master Clock. Master clock signal that is used to latch data into the master data latch.
DSA CLK	Digital Signature Analysis Clock. Clock signal that is used when troubleshooting with digital signal analyser.
DSP	Display portion. Timing signal which is used to alternately select between μ P addressing and display addressing of the dynamic RAM. When high, this signal selects the display addresses to be presented to the dynamic RAM.

Table 8-2. 1610B Mnemonics (Cont'd)

Mnemonic	Description
DTC	Dot Clock. Clock signal at video dot frequency (10 MHz) that clocks the alphanumeric shift register and the Y-position counters.
EHRSR	ECL High Run State Recognition. ECL version of HRSR.
ELMR	ECL Low Master Reset. ECL version of LMR.
EOC	End of Character Column. Signal goes true after all 7 columns of a particular character column have been scanned.
EOS	End of Scan. Signal goes through at the completion of a vertical scan.
GND SENSE	Ground Sense. Signal used to sense the reference potential for the +5 volt power supply.
GRF	Graph. Signal is true when beam is in graph portion of display. Enables graph comparator and X-position counters when true.
H10MHZ	High 10 Megahertz. This signal controls whether rear-panel probe driver is in 10-MHz count mode or in μ P load mode. When true, the probe driver is in 10-MHz count mode.
HGRFE	High Graph Enable. When true, graph comparators are enabled. This signal goes true when the μ P has stored a high in bit DO of the graph enable location in the dynamic RAM.
HADL	High Address Load. Signal is true when the μ P is addressing trigger memories and sequencing circuitry during load cycle before run.
HALT	Halt. Signal goes true when μ P halts the data acquisition circuitry.
HCAD	High Count Address. Signal increments input latches during data acquisition circuitry setup.
HCQ1, HCQ2	High Count Qualified 1 and 2. When both these signals are in the true state, it indicates that the count state term is present.
HCSTP	High Clock Stopper Out. This signal is true when the 1610B is not searching for a trace point, and it may be used to stop the clock of the system under test during this time. The signal is applied to the Measurement Enable Output (-).
HD0-HD7	High Data 0-7. True version of the μ P bidirectional data bus.
HDBE	High Data Bus Enable. TTL timing signal to the μ P equal to complement of Φ 1.
HDWS	High Disable Write Strobe. True after trace point plus required number of words have been stored in the high-speed data acquisition memory. When true, the write strobes are disabled and the storage of data in the high-speed memory is halted.
HKD0-HKD5	High Key Data 0 through 5. These 6 lines hold the code of the key that the keyboard is currently scanning.
HKYDN	High Key Down. This signal is true whenever a key on the keyboard is pressed. It is read by the μ P to see if any key on the keyboard is currently pressed.
HNJQ	High Negative Slope J Clock Qualified. Signal is true when qualifiers for the negative slope of the J clock are in the specified state.
HNKQ	High Negative Slope K Clock Qualified. Signal is true when qualifiers for the negative slope of the K clock are in the specified state.

Table 8-2. 1610B Mnemonics (Cont'd)

Mnemonic	Description
HNLQ	High Negative Slope L Clock Qualified. Signal is true when qualifiers for the negative slope of the L clock are in the specified state.
HPJQ	High Positive Slope J Clock Qualified. Signal is true when qualifiers for the positive slope of the J clock are in the specified state.
HPKQ	High Positive Slope K Clock Qualified. Signal is true when qualifiers for the positive slope of the K clock are in the specified state.
HPLQ	High Positive Slope L Clock Qualified. Signal is true when qualifiers for the positive slope of the L clock are in the specified state.
HPOP	High Power On Preset. Signal is true when +5 volt supply drops below a certain preset level. It is used to initialize the μ P and I/O circuitry whenever there is a +5 volt failure or when power is first turned on.
HREN	High Restart Enable. This signal is controlled by the μ P and is set to the true state when the restart term on the trace menu is turned on.
HREQ	High Read Request. Signal is true when the μ P is reading from one of the high-speed data acquisition circuitry addresses.
HRSR	High Run State Recognition. Signal is true during a data acquisition run. When true, it enables data acquisition circuitry to gather data. When false, it allows the μ P to set up data acquisition circuitry.
HRST	High Restart. Signal is true for approx 40 ns when a sequence is restarted.
HRUN	High Run. Signal is true during data acquisition run.
HSE	High Strobe Enable. Synchronized enable pulse for measurement, trigger and index strobes.
HSN	Horizontal Sync. Occurs at the end of the final scan of display. Synchronizes horizontal sweep generator.
HTP	High Trace Point. Signal is true whenever sequence plus trace point term is found.
HTPF	High Trace Point Found. Latched version of HTP. When true, this signal indicates that the trace point for the current run has been found.
HTRIG	High Trigger. Signal is true for approx 50 ns whenever sequence plus trace point has been found.
LA0-LA15	Low Address 0-15. Inverted version of μ P address bus.
LBUP	Low Brighten Up. Z-axis signal used in graph mode to intensify certain dots on the graph display.
LCAD	Low Card Address. When true, this signal indicates that the μ P is accessing dynamic RAM on Display Control Board A5.
LCSTP	Low Clock Stopper. Complement of HCSTP. This signal is applied to the Measurement Enable Output (+).

Table 8-2. 1610B Mnemonics (Cont'd)

Mnemonic	Description
LCT	Low Count Time. Signal controls state time clock selector and selects either the 10-MHz standard or the index strobe to clock the state time counters. When low, the 10-MHz standard is selected.
LD0-LD7	Low Data 0-7. Inverted version of microprocessor bidirectional data bus.
LDMS	Low Disable Measurement Strobe. Complement of HDWS. When true, it disables measurement strobe signal.
LFLG	Low Flag. When true, it indicates that the 9876A printer has accepted data and is busy processing data.
LHALT	Low Halt. Control signal for the μ P. When true, this signal halts data acquisition run.
LINE SYNC	Line Sync. Line frequency TTL square wave used to synchronize display circuitry with line frequency.
LIRQ1	Low Interrupt Request 1. Interrupt signal to the microprocessor's maskable interrupt input. This signal can be driven by either the delta timer or the HP-IB circuitry.
LIRQ2	Low Interrupt Request 2. Interrupt signal to nonmaskable interrupt input to the μ P. This input is driven true when the START button on the rear panel is pressed.
LMR	Low Master Reset. This signal is driven true by the μ P before initiating a run. When true, it initializes the data acquisition circuitry.
LNWKY	Low New Key. Signal from keyboard indicating that a new key has been pressed since the last time the μ P read the keyboard status.
LPCTL	Low Printer Control. Control signal from μ P to printer. When true, it indicates that the data on the printer data lines is valid.
LPD0-LPD6	Low Printer Data 0-6. Signal lines carrying printer data from 1610B to printer.
LPOP1	Low Power On Preset 1. Complement of HPOP.
LPOP2	Low Power Preset 2. Buffered version of LPOP1.
LPSF	Low Power Supply Fail. Shut down signal to switching supply. Signal will be true if -12 volt supply does not come up within a fixed period of time after the +5 volt supply comes up.
LPSYN	Low Processor Sync. When true, this signal indicates that both the μ P data bus and the μ P address bus contain valid information.
LRDKB	Low Read Keyboard. When true, it indicates that the μ P has read the keyboard. This signal resets the new key flag.
LRSR	Low Run State Recognition. Complement of HRSR.
LRSRT	Low Restart. When true, it indicates that the restart term is present.
LRUN	Low Run. Complement of HRUN.
LSEQ	Low Sequence Complete. When true, it indicates that all sequence terms have been found and the data acquisition circuitry is looking for the trace point term.

Table 8-2. 1610B Mnemonics (Cont'd)

Mnemonic	Description
LTPF	Low Trace Point Found. Complement of HTPF.
LWAR	Low Wrap Around. When true, it indicates that data has been stored in every location of the high-speed memory since the run began.
LWRT	Low Write. Buffered version of the μ P read/write line.
MA0-MA5	Multiplex Address 0-5. Multiplexed address bits for high-speed memory. They may contain information from the μ P or address information from the memory address counters.
MCS0-7	Multiplexed Chip Select 0-7. Chip select signals for high-speed memories. They can be driven true by either the μ P address decoding or by the chip select strobe.
MD0-7	Multiplexed data 0-7. Multiplexed high-speed memory outputs.
MD81	Multiplexed data 81. Output 8 of A3U1. This bit contains the stored data of the HCQ1 line.
MD82	Multiplexed data 82. Output data bit 8 of A3U2. This bit contains stored data of the HCQ2 line.
MDC	Master Display Clock. 20-MHz signal used to drive display circuitry and timing for the μ P.
MTC	Master Terminal Count. Terminal count output of Master Decade Counter.
PBC	Positive Beeper Control. This signal goes low when the microprocessor writes to address 1008 or 1009 hex; positive edge clocks the beeper control latch.
PCAQ	Positive Clear Acquisition. This signal goes true whenever the μ P writes to address 100C or 100D hex; positive edge clocks the clear acquisition latch.
PCMD	Positive Counter Mode. This signal will go low whenever the μ P writes to address 100A or 100B hex; positive edge clocks the probe driver mode control latch.
PPC	Positive Printer Control. This signal goes low whenever the μ P writes to address 1000 or 1001 hex; positive edge clocks the printer control latch.
PPDC	Positive Probe Driver Control. This signal goes low when the μ P writes to address 100E or 100F hex; positive edge latches a byte of data into the probe driver counters if the H10MHZ signal has been set to the low state.
PPDL	Positive Printer Data Latch. This signal goes low when the μ P writes to address location 1002 or 1003 hex; positive edge latches a byte of data from the μ P data bus into the printer latch.
PSCN	Prescan. When this signal goes high, it ends the horizontal sync signal. The signal does not go true until after the horizontal sweep has started, thus allowing the horizontal ramp to become linear before the display is enabled.
PTC	Positive Timer Control. This signal will go true when the μ P writes to address 1006 or 1007 hex; positive edge clocks the Delta Time Control Latch.
Q0-Q3	Qualifiers 0-3. Qualifier signals from clock probe.
QCLKJ	Qualified Clock J. Qualified version of Clock J coming from positive/negative slope one-shots.

Table 8-2. 1610B Mnemonics (Cont'd)

Mnemonic	Description
QCLKK	Qualified Clock K. Qualified version of Clock K coming from positive/negative slope one-shots.
QCLKL	Qualified Clock L. Qualified version of Clock L coming from positive/negative slope one-shots.
R0-R3	Row Select 0-3. Decoded μ P address bits LA7 and LA8.
RC1, RC2	RAM Chip Enable 1, 2. 0 to 12 volt chip enable signals to dynamic RAM.
RCE	RAM Chip Enable. TTL timing signal that generates RAM chip enable signal; negative edge latches RAM output data.
READSTRB1, 2, 3	Read Strobes 1, 2, 3. Strobe signals that latch data from high-speed data acquisition circuitry so the μ P can read data at lower speed.
RSTAME1, 2	Restart AME1, 2. Two signals from trigger RAMs that define the restart term; when both are in the high state, it indicates that the restart term is present.
RSTF	Restart Flag. Flag to μ P which indicates that sequence has been restarted.
SA0-SA3	Sequence Address 0-3. Address bits for next sequence address RAM, sequence occurrence count RAM and sequence selector RAM. The state of these lines defines which sequence the Data Acquisition Circuitry is currently looking for.
STC	State Clock. Display timing signal occurs once every time a row of a particular character has been displayed.
S GND	Shield Ground. Ground for rear-panel output circuitry.
SYNC ENABLE	Sync Enable. Signal goes high after display character column counters have reached Column 100 state. When high, sync enables line sync signal to parallel load display character column counters to terminal count and halt horizontal sync signal.
TTC	Terminal Count Column. Terminal count output of display character column counters. When high, this signal halts the horizontal sync signal.
TCX	Terminal Count X-Position Counters. When high, this signal starts the horizontal sync signal; positive edge clocks graph enable latch.
TH0-TH7	Trigger High 0-7. Trigger signals 0 through 7 which are decoded from the 16 higher order data bits.
TL0-TL7	Trigger Low 0-7. Trigger signal 0-7 which are decoded from the 16 lower data bits.
TRC-C	Trace Count. Signal goes high when trace only state terms have found the specified number of occurrences.
TRC-E	Trace Event. Signal goes high when any of the trace only state terms have been found.
VH1-VH16	Voltage High 1-16. Signals from pull-up resistors which create a continuous TTL high level.
VSN	Vertical Sync. Vertical Sync signal used to synchronize vertical sweep circuitry and to drive the flyback circuitry.

Table 8-2. 1610B Mnemonics (Cont'd)

Mnemonic	Description
VTCLK	Voltage Threshold Clock. Threshold voltage for clock probe from front-panel threshold switch.
VTDATA1-VTDATA4	Threshold Voltage Data 1-4. Threshold voltage for Pods 1-4 from front-panel threshold switches.
VTH1-4	Threshold Voltage 1-4. Threshold voltages to pods 1 through 4.
VTHGND1-4	Threshold Ground 1-4. Threshold ground signals coming from Pods 1-4. These signals are used to compensate for ground differences between 1610B and system under test.
ZOT	Z-axis Output. Z-axis blanking signal to the Z-axis amplifier.
$\Phi 1$	Phase 1. Clock signal for microprocessor.
$\Phi 1$ SYNC	Phase 1 Sync. Timing signal used to synchronize μP $\Phi 1$ signal with display circuitry so that dynamic RAMs may be shared between the μP and the display circuitry.
$\Phi 2$	Phase 2. Microprocessor Clock Signal.
$\Phi 2$ DELAYED	Phase 2 Delayed. Delayed version of $\Phi 2$ signal used to generate LPSYN signal.
10MHZ STD	10-Megahertz Standard. 10-MHz signal used to clock state/time counters and rear-panel probe driver.

8-16. CONTROL AND I/O. Major components in the control section are the 6800 μ P, the μ P program ROM, and the μ P RAM. All three of these must be functioning in order for the control section to operate properly. The I/O circuitry consists of the keyboard, rear-panel probe driver, state/time counter reset circuit, delta timer, beeper, and printer interface.

8-17. The purpose of the control section is to interface the I/O circuitry, display section, and the data acquisition section. A typical sequence of events is as follows: When power is applied to the 1610B, the control section is initialized and the 6800 μ P starts executing instructions from the μ P program ROM which instruct the μ P to initialize the data acquisition circuitry and the display RAM. The format menu is then displayed, and the μ P begins a continuous check of the keyboard to see if a key has been pressed. When a key is pressed, the μ P interprets this key and updates the display RAM. The display will now show which key was pressed and update the current data acquisition setup file if needed, depending on which key was pressed. When the control section recognizes that the TRACE key has been pressed, it loads the data acquisition section according to information contained in the current data acquisition setup file and instructs the data acquisition circuitry to begin gathering data. The μ P then monitors flags from the data acquisition circuitry, and as words are written into high-speed memory, the μ P reads this data from memory, formats it, and writes it into the display RAM.

8-18. DISPLAY. This section continuously reads data stored in the display RAM and displays it on screen. The display circuitry consists of two major portions: display controller and display driver. The display controller continuously reads data out of the display RAM and provides the display driver with four signals: ZOT, LBUP, HSN, VSN. ZOT (Z-axis Output) and LBUP (Low Brighten Up) are combined by the display driver to form the composite video signal that is applied to the Z-axis. HSN (Horizontal Sync) and VSN (Vertical Sync) are used by the display driver to reset the horizontal and vertical sweep circuits respectively. VSN is also used to drive a flyback circuit which generates 15 kV for the CRT.

8-19. DATA ACQUISITION. The data acquisition section gathers data from the circuit under test and stores it in high-speed memory according to the current setup. This includes such tasks as recognizing a sequential trigger, clock qualification, storing state/time information, etc. The data acquisition circuitry can gather and store data at clock rates up to 10 MHz; so once data has been stored in high-speed RAM, the μ P can then read it out at the lower μ P rate.

8-20. Signals from the circuit under test are presented to the probe inputs and compared with a voltage from the threshold circuit. Signal levels above this threshold voltage are considered to be a logic 1; signals below the

threshold voltage are considered to be a logic 0. The clock probe outputs are presented to inputs of the qualification and internal clock (strobe) generator circuits which provide the data acquisition circuits with a number of different data acquisition clocks whenever a qualified clock transition occurs.

8-21. The data probe outputs are presented to high-speed memory and the trigger and data storage control circuits. These circuits control storage in the high-speed memory so that data is stored only when it meets all requirements of the current setup. Information from the state/time counters is also stored in high-speed memory along with data from the data probes.

8-22. The data acquisition section receives setup and control information from the μ P and provides flags to the μ P so it can read current status of the data acquisition circuitry. This section also obtains certain information about data that has been stored in high-speed memory.

8-23. BASIC BLOCK DIAGRAM TROUBLESHOOTING.

8-24. When troubleshooting the 1610B, the four major sections should be checked and repaired in the following order: (1) power supply, (2) display, (3) control and I/O, and (4) data acquisition.

8-25. The power supply circuitry is contained in Power Supply Assembly A18 and Low Voltage Power Supply Assembly A10. All output voltages can be verified by measuring them with a suitable voltmeter. If one or more voltages are not present, all other assemblies connected to Mother Board A11 can be removed to isolate an assembly that may be overloading one or more of the supplies. With all power supply voltages present, the LPOP signal should be at a TTL high level and the Line Sync signal should be a TTL square wave of line frequency.

8-26. The display section must be operating properly in order to verify the control and I/O section. This does not mean there must be intelligent information on screen, but the characters must be formed and displayed properly. If the control and I/O section is not working, the 1610B will display a random pattern of characters. If the control and I/O section is functioning properly, perform the Display Test in Section IV to verify proper operation of all display circuitry.

8-27. To verify operation of the control and I/O section, refer to Section IV and perform the following: ROM/RAM Test, Keyboard Test, Interrupt Test, and Printer Test. If the control and I/O section does not function properly, remove assemblies A1, A2, and A3 (which contain the data acquisition section), and perform the control and I/O tests listed above.

8-28. The Trace Test in Section IV verifies operation of Probe Driver Board A16 and the data acquisition section.

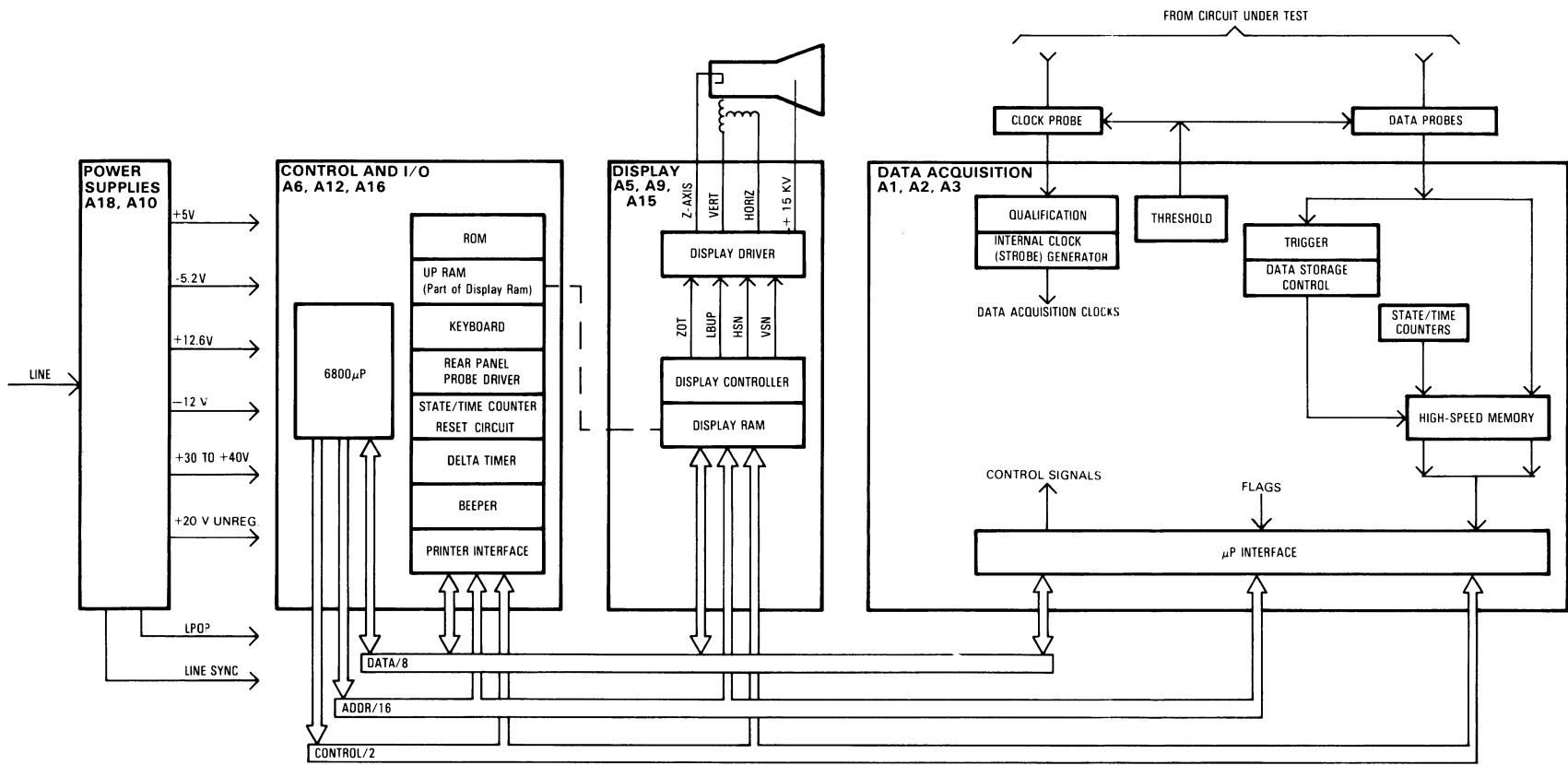
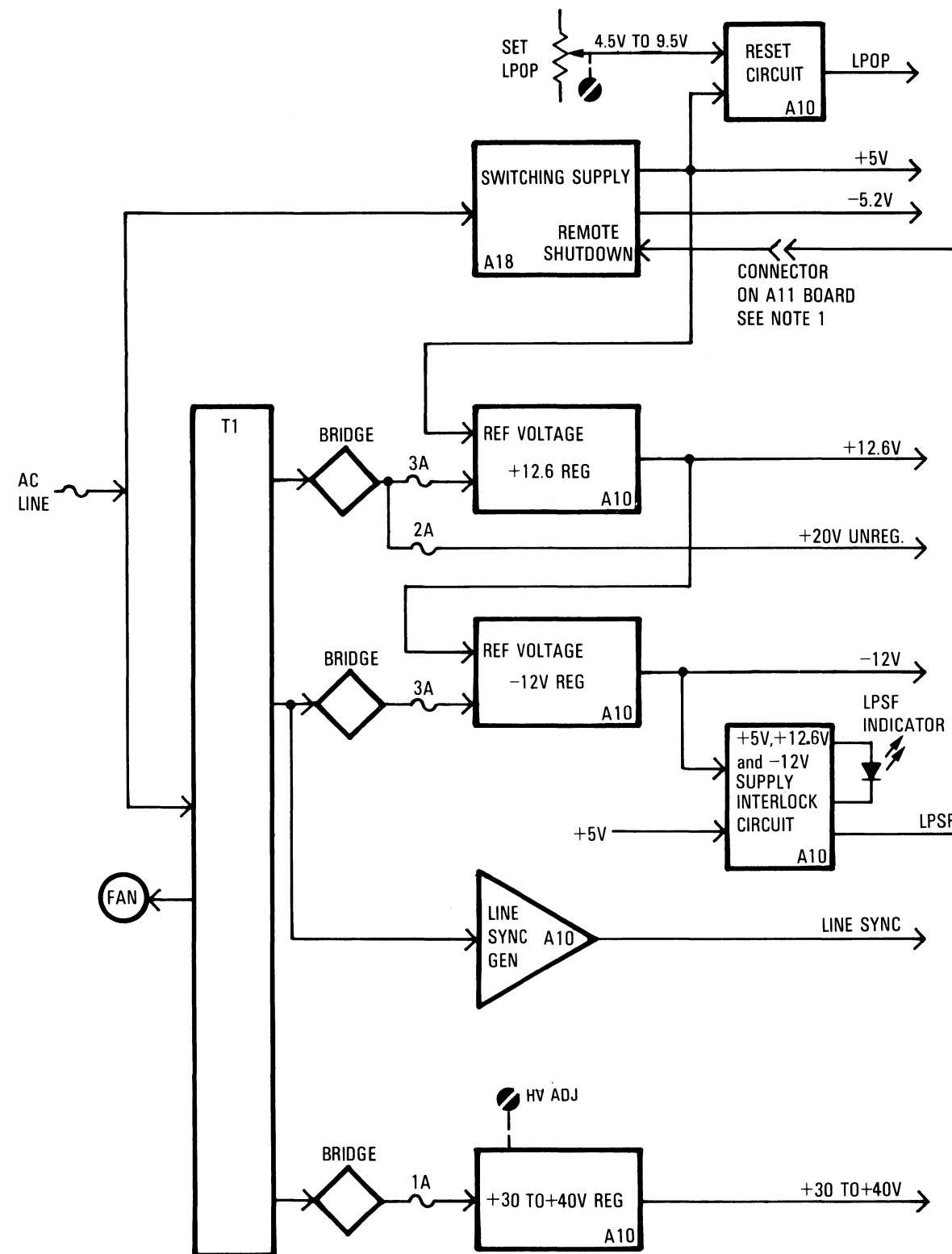


Figure 8-1.
1610B Basic Block Diagram
8-9



NOTE 1 THIS CONNECTOR MAY BE MOVED TO DISABLE THE REMOTE SHUTDOWN

CAUTION

ASSEMBLY A5 MUST BE REMOVED BEFORE MOVING THIS CONNECTOR
TO PREVENT POSSIBLE DAMAGE TO MEMORY CIRCUIT .

8-29. POWER SUPPLY BLOCK DIAGRAM DESCRIPTION. (See figure 8-2.)

8-30. The 1610B Power Supply provides the following voltages and signals: +5 V, -5.2 V, +12.6 V, -12 V, +30 to +40 V, +20 V unregulated, LPOP, and Line Sync. The +5 V and the -5.2V come from the switching supply contained in 5-Volt Power Supply Assembly A18. This supply has a remote shut-down feature which (in conjunction with the circuit connection) forms an interlocking configuration consisting of the +5 V, +12.6 V, and -12V supplies. The purpose of this feature is to protect certain memory elements on the A5 Board which could be damaged if only part of these supplies are working. The +5 V, +12.6 V, and -12 V supplies are cascaded by using the output of one supply as a reference voltage input for the next supply. Therefore, the +5V supply must be up before the +12.6V can come up, and the +12.6V must be up before the -12V can come up.

8-31. The purpose of the interlock circuit is to shut down the power supply via the LPSF (Low Power Supply Failure) signal if the +5 V supply comes up and either +12.6 V or the -12 V supply fails; it does this by monitoring outputs of the +5 V and -12 V supplies. When the -12 V does not come up within a fixed time period after the +5 V comes up, LPSF is set to the lowest state (approx +1.5 V). This shuts down the +5 V switching supply and causes the LPSF indicator to come on. Due to the configuration of the switching supply, the +5 V supply must be working before the -5.2 V supply can come up.

8-32. The +20 V unregulated supply is used in the vertical drive circuitry and the +30 to +40 V supply is used in the high-voltage circuitry. The ac line is connected through a fuse to transformer T1 and directly to the switching supply. The fan is connected across one half of the primary of the transformer thus providing it with the correct voltage no matter which ac input line voltage is used. The line sync generator takes the output from one of the secondary windings of T1, filters it, and converts it to a TTL signal of the line frequency. This signal goes to the display controller circuitry where it is used to synchronize the display with the line frequency. The

reset circuit continuously compares the output of the +5 V supply with a fixed reference voltage as set by the LPOP (Low Power On Preset) adjustment (normally 4.75 V). If the output of the +5 V switching supply drops below this reference voltage, LPOP will be set to the low state. LPOP is a TTL signal that is used to reset the 6800 uP (microprocessor) and the I/O circuitry. When the +5V output goes above this threshold level, LPOP will return to the high state after two line cycles.

8-33. POWER SUPPLY BLOCK DIAGRAM TROUBLESHOOTING.

8-34. The 1610B power supply should be checked and repaired in the following order: first the interlocking supplies +5 V, +12.6 V, and -12 V; then the -5.2 V, +20 V unregulated and +30 to +40 V supplies. After all supplies are operating properly, the line sync generator circuit and the reset circuit may be checked. Due to the cascading and interlock configuration of the +5 V, +12.6 V and -12 V supplies, if one supply fails, the other two will be shut down. To isolate which supply is causing the shutdown, a test connector (J4) is provided on Mother Board A11. When this connector is moved to the test position, the remote shutdown to the switching supply is disconnected, thus allowing the switching supply to come up.

CAUTION

Assembly A5 must be removed before connector A11J4 is moved to the TEST position to prevent damage to the memory elements on Assembly A5.

Once the interlocking supplies are working and the LPSF indicator is off, return connector A11J4 to the normal position and check outputs of the -5 V, +20 V unregulated, and +30 to +40 V supplies. When all these supplies are functioning, the line sync generator and LPOP circuits can be checked. Output of the line sync generator should be a TTL squarewave of the line frequency; output of the reset circuit (LPOP) should be at a TTL high level with all supplies working and the LPOP adjustment set at 4.75 V.

Figure 8-2. Block Diagram, 1610B Power Supply

LOCATED UNDER FOLD

8-35. CONTROL AND I/O BLOCK DIAGRAM DESCRIPTION. (See figure 8-3.)

8-36. CONTROL SECTION. The control section consists of three major components: the 6800 μ P (microprocessor), the μ P program ROM, and the μ P and display RAM. The major function of the μ P is to read and execute instructions contained in the μ P program ROM. There are six inputs to the μ P: three timing signals $\Phi 1$, $\Phi 2$, and HDBE and three control inputs RESET, $\overline{\text{NMI}}$, and $\overline{\text{IRQ}}$. The timing signals (derived from the 20-MHz oscillator) run continuously. The 20-MHz oscillator provides a TTL-level, 20-MHz squarewave to a divide-by-two network. The output of this network is a 10-MHz signal which is applied to a divide-by-10 and a divide-by-20 network. Output of the divide-by-10 network is a signal called $\Phi 1$ Sync, which synchronizes the divide-by-20 network with other signals that are used to run the display circuitry. This is done so the μ P and display circuitry can timeshare the microprocessor and display RAM properly. The three outputs of the divide-by-20 network ($\Phi 1$, $\Phi 2$ and HDBE) run at .5 MHz and are used for internal timing by the 6800 μ P. The three control inputs function as follows: the RESET input is an active low; when in the low state, all internal registers of the μ P are initialized. When the RESET line returns to the high state, the μ P is allowed to start executing code from a fixed address. The μ P will reset via the LPOP line if there is a power failure or whenever the rear-panel START switch is pressed. The $\overline{\text{NMI}}$ input is the non-maskable interrupt to the microprocessor; this input is negative-edge sensitive. When a negative transition is detected on the $\overline{\text{NMI}}$ input, the μ P will automatically jump to a fixed address and start executing instructions at that address. The $\overline{\text{NMI}}$ input is used in conjunction with the START switch. When this switch is pressed, the μ P is reset; when the switch is released, the μ P receives a nonmaskable interrupt to go to the self-test routine. The $\overline{\text{IRQ}}$ input on the μ P is the maskable interrupt request input. This means that the $\overline{\text{IRQ}}$ input may be either enabled or disabled by instructing the μ P to either set or reset an internal bit called the interrupt-mask bit. This input is a low true level sensitive input. Therefore, when $\overline{\text{IRQ}}$ input is low and the interrupt mask is reset, the μ P will automatically jump to a fixed address and start executing instructions at that address.

8-37. There are three buses associated with the microprocessor: data, address, and control. Together, these buses are referred to as the μ P bus and all devices that communicate with the μ P are connected to this bus. The μ P performs only two functions with these devices; it either reads data from, or writes data to the devices. Individually, the three buses function as follows: (1) The data bus is a bidirectional bus. It can either carry data from a device to the μ P, in the case of a read, or it can carry data from the μ P to a device, in the case of a write; (2) The address bus holds the address of the device that the μ P either reads from or writes to; (3) There are two signals associated with the control bus: LWRT and LPSYN. LWRT is a buffered version of the read write

line from the μ P. When this signal is low, it tells all devices on the bus that the μ P is doing a write operation; in the high state, it tells the devices that the μ P is doing a read operation. LPSYN is a timing signal that is the combination of the VMA signal from the μ P and the $\Phi 2$ clock. When this signal is in the low state, it indicates that the address and data buses contain valid data. This is done so that devices on the bus ignore the address and data bus signals while they are changing.

8-38. The μ P program ROM contains all programming instructions and data needed by the μ P to control the 1610B. The μ P display RAM is used by the μ P as a scratch-pad memory to store temporary data and also to store data that is to be displayed on the CRT.

8-39. I/O SECTION. The 1610B I/O section consists of the keyboard, the rear-panel probe driver, the state/time counter reset circuit, beeper, printer interface, delta timer and the HP-IB option (if installed). Each key on the keyboard has a unique address. The keyboard circuitry continuously scans through each key address and provides 8 signal lines to the keyboard interface circuitry. Six of the lines contain the key address that is currently being scanned by the keyboard. The other two signal lines, HKDN (High Key Down) and LNWKY (Low New Key), provide keyboard interface circuitry with the current status of the keyboard. As the keyboard circuitry scans through each address, it checks to see if a key has been pressed. If it finds that a key has been pressed, it will set HKDN high, LNWKY low, and will stop the scanning process at the address of the key that was pressed. LNWKY will remain in the low state until the μ P has read that the key is pressed. After LNWKY returns to the high state and the key is released, the keyboard circuitry will resume scanning through the key addresses.

8-40. The rear-panel probe driver provides a signal source for the data and clock probes so they can be checked. The probe driver can operate in one of two modes; it can either put out a binary count pattern at a 10-MHz rate, or the μ P can write directly to the data outputs. Both modes are used when the 1610B is in the trace test portion of self test. In all other cases, the probe driver will be in the 10-MHz binary count mode. The state/time counter reset circuit is used to reset the state/time counters in the data acquisition section when the 1610B is in the trace test portion of self test. A low-going pulse on the LCLACQ line will reset the state/time counters. When the 1610B is not in the trace test portion of self test, LCLACQ will be high.

8-41. The μ P controls the beeper by writing to one of two addresses. One address will turn the beeper on; the other address will turn the beeper off.

8-42. The printer interface in the 1610B interfaces the μ P to an HP 9866 printer. Data is transferred to the printer in ASCII code over seven data lines. Signal lines LFLG (Low Flag) and LPCTL (Low Printer Control)

make up a two-wire handshake. LPCTL indicates that the μ P has a valid data byte on the data lines. When LFLG goes low, it indicates that the printer has accepted the data byte; this line will remain low as long as the printer is processing the data byte.

8-43. The delta timer generates time delays for the 6800 μ P so it will not be tied up during these delays. When the μ P starts a delay, it writes to the delta timer and enables it to start its timing sequence. After a fixed period of time, the delta timer will pull on the LIRQ1 line which is connected to the $\overline{\text{IRQ}}$ on the μ P. This informs the μ P that the fixed amount of time has elapsed.

8-44. The HP-IB option is described in a separate supplement to the 1610B service manual.

8-45. CONTROL AND I/O BLOCK DIAGRAM TROUBLESHOOTING.

8-46. When troubleshooting the control and I/O section, the control circuitry should be repaired first because it is used to test and evaluate the I/O circuits. To verify the control section, perform the ROM/RAM test in the Performance Verification (refer to Section IV).

8-47. When a failure occurs in the control section, several symptoms that may be observed are as follows:

- a. Random characters may be displayed on screen because the μ P is not executing code properly and, therefore, is not writing correct information into the display RAM.
- b. When power is turned on, the 1610B normally beeps twice. The first beep occurs whenever the +5 V supply comes up. The second beep indicates that the μ P has completed initialization of the 1610B. If the control section is not operating properly, the μ P will not be able to initialize the instrument and the second beep may not occur.
- c. The instrument will not pass the ROM/RAM test.

8-48. If the μ P is able to properly read and execute instructions from the ROM and the ROM/RAM test fails, the μ P will continually repeat the ROM/RAM test. This will result in a display that is continuously cycling between two sets of random characters. If the μ P cannot read and execute instructions from the ROM properly, the display will contain a static pattern of random characters. When troubleshooting the 1610B, if only one beep occurs when power is turned on or if the display is filled with random characters, the ROM/RAM test should be performed. If the display is cycling between two sets of random characters when the ROM/RAM test is performed, it indicates that the μ P is executing instructions properly and is able to read instructions from the μ P program ROM. If the display is not cycling, move A6U47 to the test position. This places the NOP instruction on the μ P data bus regardless of the address the μ P is reading from. This should put the μ P in a mode of continually cycling through its entire address range,

attempting to read an instruction from each address location. The VMA line may be checked at this time to see if the μ P is functioning properly. If the VMA line is continuously pulsing, it indicates that the μ P is executing instructions. If the VMA line is not pulsing, the $\Phi 1$, $\Phi 2$, HDBE, and reset inputs of the μ P should be checked. The $\Phi 1$, $\Phi 2$, and HDBE should be continuous .5 MHz signals and the reset line should be in the high state. The NMI and $\overline{\text{IRQ}}$ lines should also be checked; NMI is normally in the low state and $\overline{\text{IRQ}}$ is normally in the high state. If the VMA line is pulsing, the address bus and data bus should be checked for activity and good logic levels.

8-49. When the control section passes the ROM/RAM test, the I/O section may be checked.

8-50. The keyboard and its interface are checked by performing the keyboard test in the performance verification. Normally, with no key pressed, the keyboard is continuously scanning every key on the keyboard. When a key is pressed the HKDN signal will go high and the scanning process will stop. The 6 lines which contain the key code should correspond to the key that is pressed. Also, when a key is first pressed, LNWKY will go low until the μ P has read the keyboard, at which time it will return to the high state. So if the keyboard test fails, these signals should be checked to isolate the problem to either the keyboard or the keyboard interface circuitry.

8-51. The rear-panel probe driver and the state/time counter reset circuit are both exercised in the trace test during performance verification. If the trace test fails, press the trace key to execute this test continuously and check the output of each circuit for activity.

8-52. When power is turned on, the beeper circuit may be checked. The 1610B normally beeps twice when power is applied. The first beep occurs whenever the +5 V supply comes up. The second beep indicates that the μ P has completed initialization of the 1610B. If the control section is not operating properly, the μ P will not be able to initialize the instrument and the second beep may not occur.

8-53. The delta timer may be checked by performing the interrupt test in the performance verification to make sure that an interrupt is generated after the correct amount of time. If this test fails, it may be run continuously so that all associated signals can be checked for activity.

8-54. The printer interface may be verified by connecting an HP 9866 printer to the 1610B and executing the printer test in the performance verification. This test may be run continuously, and all associated signals can be checked for activity.

8-55. Troubleshooting for the HP-IB Option is included in a separate supplement supplied with the 1610B.

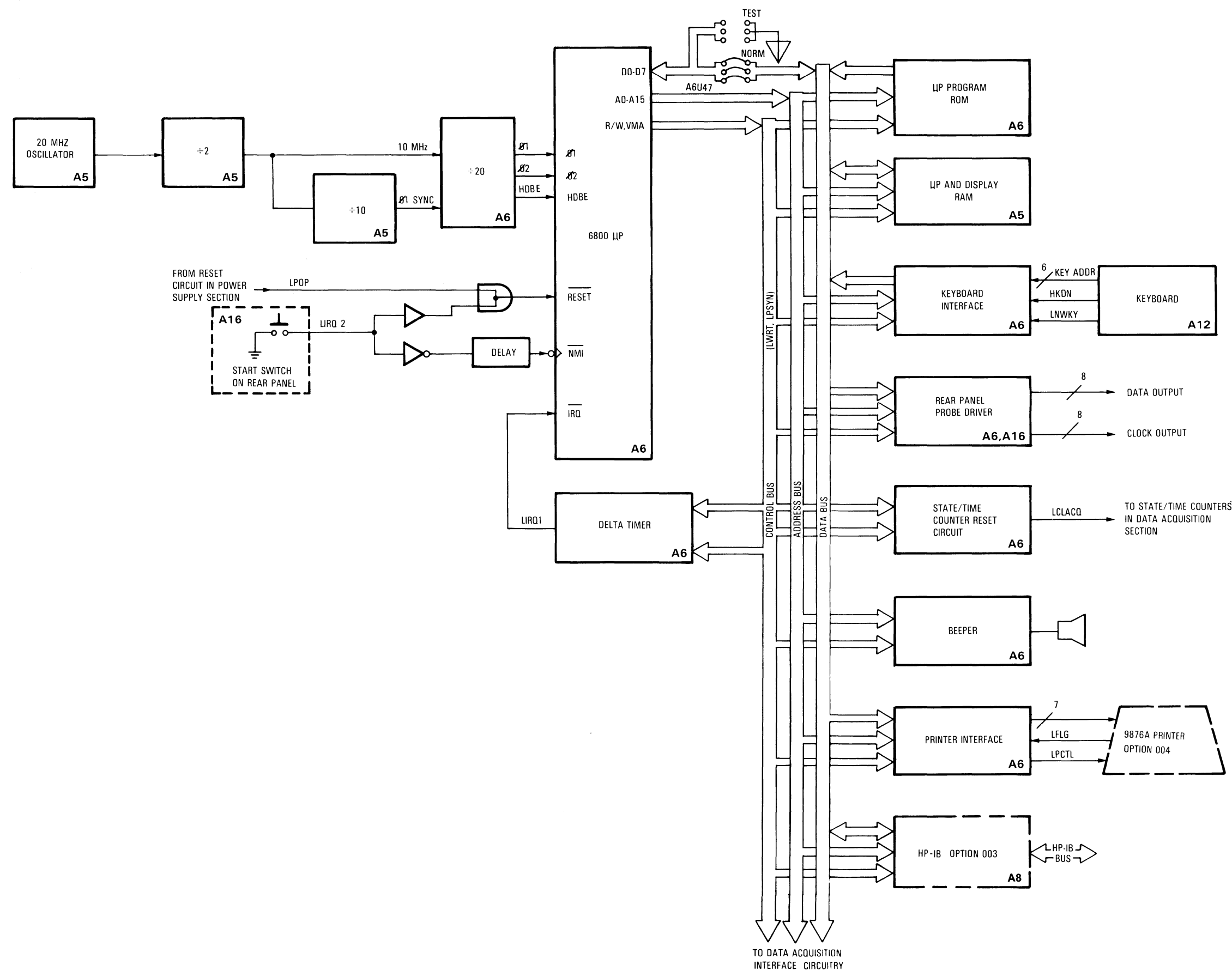
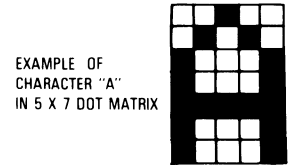
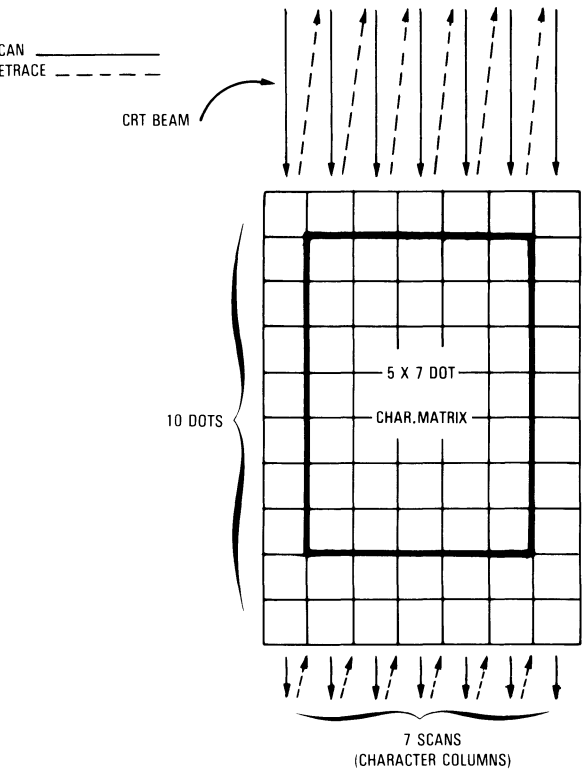


Figure 8-3.
Block Diagram, 1610B Control and I/O Section
8-13

8-56. DISPLAY BLOCK DIAGRAM DESCRIPTION (See figure 8-4).

8-57. The 1610B can display either alphanumeric data (characters and symbols), or it can graph 64 points of data on screen. All data to be displayed is stored in the upper 2K of the 4K X 8 dynamic RAM.

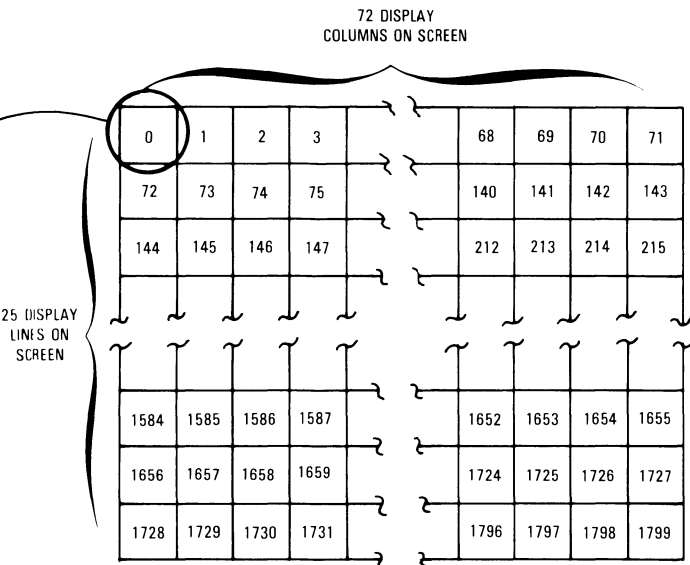


EXAMPLE OF CHARACTER "A" IN 5 X 7 DOT MATRIX

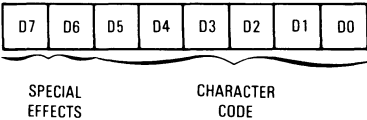
Alphanumeric Character Formation

8-59. There are 72 display columns and 25 display lines which yield a total of 1800 character locations on screen. The 1610B can display 64 different characters which include the upper-case alphabet, digits 0 through 9, and various other symbols. Each character has a unique 6-bit character code. This code, along with two bits of data which describe the special effects, makes up one 8-bit word as shown at right.

8-58. The display section employs a vertical scanning technique; i.e., the CRT beam continuously scans from top-to-bottom, left-to-right across the face of the CRT. This forms a raster pattern of vertical lines on the screen. The display circuitry synchronizes this scanning process via VSN (Vertical Sync) and HSN (Horizontal Sync). As the beam is scanning, the display circuitry will either blank or unblank the CRT beam, thus forming the graph and the characters. Alphanumeric characters are displayed as shown below.



SPECIAL EFFECTS DECODING		
D7	D6	Character Display
0	0	NORMAL
0	1	BLINKING
1	0	INVERSE
1	1	INVERSE



Alphanumeric Data Word Format

One 8-bit word for each character is stored in the dynamic RAM. The relative address of each character is indicated (as shown in the display figure at left) by the numbering at each character location. Each character is made up of 7 scans or character columns with 10 dots in each column; this forms a 7 X 10 dot matrix. Inside this matrix is a 5 X 7 dot character matrix where the characters are actually formed. The extra dots outside of the 5 X 7 dot character matrix are used for spacing of characters. Due to the vertical scanning technique, one character column in a particular display column is displayed during each vertical scan. Therefore, it will take seven vertical scans to complete one display column. Consider the first vertical scan for example: the CRT beam starts in the upper left-hand corner of the display and scans one time from top to bottom; the first column of character zero will be displayed, then the first column of character 72, then the first column of character 144, and so on until the first column of character 1728 is displayed. The beam then returns to the top of the screen and starts the second vertical scan where it will display the second character column of each character. The code for each character in the display column must be read out of the dynamic RAM every time a character column of a new character is to be displayed. Therefore, the display circuitry must address the dynamic RAM in the following order for the first vertical scan: 0, 72, 144, etc., up to 1728. Portions of the display circuitry which generate these addresses are: the display line counter, the display column counter, and the display address adder. The display line counter generates a count by 9; i.e., it counts 0, 9, 18, 27, etc. Outputs of the display line counter and the display column counter are applied to the display address adder. The sum of these outputs forms the display address which is applied to the dynamic RAM via the μ P/display address selector. The three least significant bits from the display column counter form the three least significant bits of the display address. This effectively shifts addresses from the display address adder by three binary digits and multiplies the address from the display address adder by $2^3=8$. So instead of incrementing in a 0, 9, 18 sequence, the display address will now increment in a 0, 72, 144 sequence, which is required to address the RAM correctly. When the display circuitry addresses the RAM, data coming from the RAM is first latched into the master latch then into the alpha data latch. The six bits of data which form the character code are applied to the character generator along with three bits of data from the character column counters. Data on the character address inputs instruct the character generator which character to display while data on the column address input instruct which column of the character it should output. The eight outputs of the character generator indicate which dots in the specific column for that particular character should be bright (high) and which dots should be blank (low). This data is then loaded into the parallel-loadable shift register where it is shifted out serially and applied to the Z-axis; now it will either gate on or off each particular dot. The parallel-loadable shift register receives 10 clock pulses between

each load pulse, thus shifting out 10 dots of information. Since the serial input is tied to ground, the last two dots shifted out will always be low. The other two bits of information (in the alpha data latch) describe the special effects for that particular character and are applied to the special effects circuit. Here they are decoded to form the inverse video control and blank control signals which select either the Q or $\bar{Q}$ output of the parallel-loadable shift register to form either a normal or inverse video character respectively.

8-60. To summarize operation of the alphanumeric section of the display circuitry, let us assume that we have just begun to display the first character column of character 0; the display line counter, the display column counter, and the character column counter are all at zero. Data stored in location zero of the dynamic RAM is fed into the alpha data latch, then applied to the character generator and the special effects circuitry. The character generator will now output column zero of the particular character. This output is loaded into the parallel-loadable shift register and shifted out through the Z-axis multiplexer. When all ten dots have been shifted out, a state clock is generated which will clock the display line counter. This increments the display line counter from zero to nine and changes the display address from zero to 72. Therefore, the character code stored in RAM address 72 is loaded into the alpha data latch, then shifted out to the Z-axis multiplexer. After all 10 dots are shifted out, the display line counter is again clocked by the state clock. This continues until the first column of all 25 display lines are shifted out on the Z-axis. Now the display counter will output an EOS (End Of Scan) signal to indicate that it has completed scanning the first column of every character in the first display column. The EOS signal allows the character column counter to increment from zero to one, so on the next scan the second character column of each character will be displayed. This will continue for seven scans, at which time the character column counter will be at state 6. At the end of the scan of the last character column, the character column counter will generate an EOC signal (End Of Column). This indicates that all seven character columns have been displayed and allows the display column counter to increment, thereby displaying the next display column of characters. This continues until all 72 display columns are displayed, at which point the CRT beam will return to the first character column of character zero, thereby completing one display cycle.

8-61. When graph display is selected, the μ P will store a high in the D0 position of a certain location in the dynamic RAM which is read by the graph display circuitry. When this bit is set high, the graph circuitry is enabled. The μ P also stores blank characters in locations where the graph is to be displayed so that no alphanumeric information will be displayed in the graph section of the screen. The graph section starts at the end of display column 34 and continues through to the end of the screen. Graph data is read from a dynamic

RAM during vertical retrace whenever the beam is in the graph portion of the screen (after display column 34). The graph position counters, in conjunction with the display line counters, form the display addresses used to read graph data from the dynamic RAM. The GRF signal allows the position counters to count only when the beam is in the graph portion of the screen. Therefore, the correct data is read from a dynamic RAM depending on the X-position of the CRT beam in the graph. The VSN start signal controls the alpha graph address selector, so outputs of the graph position counter are applied to a dynamic RAM only during vertical retrace. During the vertical retrace period, graph data is read from a dynamic RAM and latched in both the master latch and the graph data latch. The seven least significant bits of data in the graph data latch are compared with the output of the Y-position counters. The Y-position counters are initialized at the beginning of each scan and will increment as the beam scans down the screen. When the output of the Y-position counters is equal to the seven least significant bits of the graph data latch, the comparator will output a high, thus plotting a point on the graph. The most significant bit latched in the graph data latch is used to intensify certain points on the graph. If this bit is set high, the LBUP (Low Brighten Up) signal will go true when the point is plotted, thus intensifying the point. At the end of every display cycle the graph enable latch will latch the D0 bit of the graph enable address location. If the μ P has stored the high in this location, it will indicate to the graph video logic that the graph is to be displayed on screen, and HGRFE (High Grade Enable) will go high.

8-62. The upper 2 K of the 4 K by 8 dynamic RAM is used only to store data that is to be displayed on screen; the lower 2 K is used by the μ P as a scratch pad memory. The μ P and the display circuitry time-share the dynamic RAM. Time-sharing activity is controlled by the decode and timing logic and occurs at such a rate as to be transparent to both the μ P and the display circuitry. When DSP is high, the display circuitry has access to the dynamic RAM. When DSP is low and the μ P is trying to address the RAM, the high μ P RAM accessing signal will go low and allow the μ P access to the RAM. During a μ P read operation from the RAM, the μ P read from RAM line will go high, allowing data latched in the master latch to be applied to the μ P data bus.

8-63. The display control circuitry generates two timing signals which are used to synchronize the scanning process: VSN (Vertical Sync) and HSN (Horizontal Sync). When VSN goes high, it initiates vertical retrace;

when HSN goes high, it initiates horizontal retrace. The vertical sweep generator uses VSN and the +20 V unregulated supply to generate a current ramp to drive the vertical yoke. The horizontal sweep circuit uses VSN and HSN signals to generate the current ramp to drive the horizontal yoke. The Z-axis amplifier amplifies the ZOT (Z-axis Output) and LBUP (Low Brighten Up) signals that modulate the cathode to the CRT, thus turning the CRT beam on and off. The flyback circuitry uses the +30 to +40 V supply and the VSN signal to generate several voltages to drive the CRT and the Z-axis amplifier.

8-64. DISPLAY BLOCK DIAGRAM TROUBLE-SHOOTING.

8-65. The display circuitry runs continuously, so troubleshooting can usually be performed with an oscilloscope and voltmeter. In case of trouble, the inputs of the display controller section should be checked first. There should be activity on the ZOT line, and VSN and HSN waveforms should be as shown on the schematics. The +20 V unregulated and +30 to +40 V supplies must also be present; if all these signals are present, the problem lies in the display driver circuitry. Display driver circuitry should be checked in the following order: flyback circuit, Z-axis amplifier, vertical sweep generator, and horizontal sweep generator. When troubleshooting the display controller section, the ROM/RAM test should be performed to determine if the μ P can read and write from a dynamic RAM correctly. If this section is not working, it should be repaired first. When the ROM/RAM test passes, the μ P loads the dynamic RAM with data to be displayed during the display test. Therefore, all functions of the display controller circuitry can be checked.

8-66. The display controller circuitry consists mainly of a number of counters which may be checked by comparing their output waveforms to those shown on the schematics. These counters are driven from the 20-MHz oscillator that drives a divide-by-10 circuit and a divide-by-2 circuit which supply various timing signals to the display counters. Display counters should be checked in the following order: display line counter, character column counter, display column counter, graph position counter, and Y-position counters. After these counters have been verified, the vertical sync and horizontal sync generators may be checked. Complete the display controller circuitry troubleshooting by checking all remaining signals for good logic levels and for activity on each line.

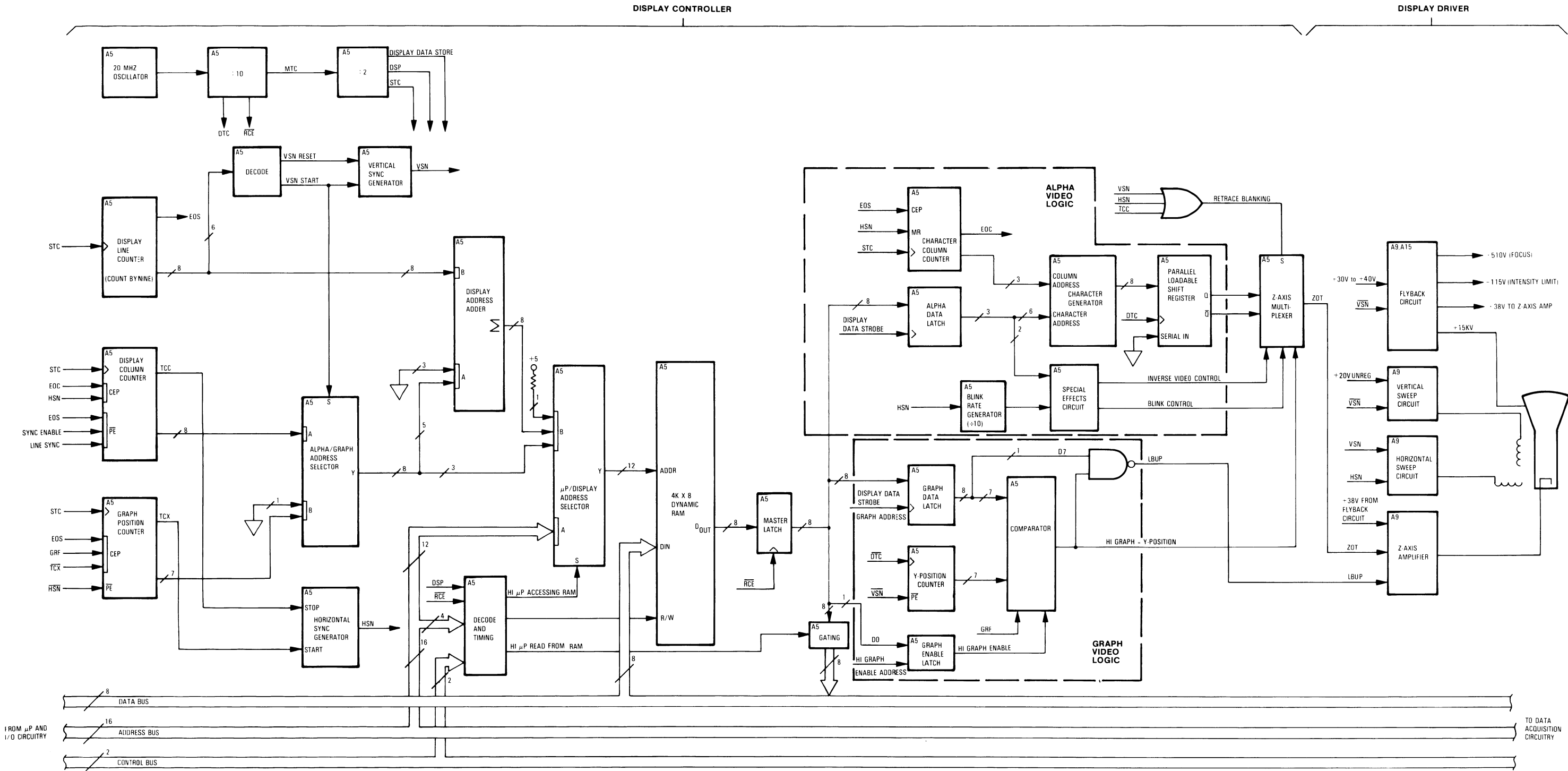


Figure 8-4.
Block Diagram, 1610B Display Section
8-15

8-67. DATA ACQUISITION BLOCK DIAGRAM DESCRIPTION (See figure 8-5).

8-68. The function of the data acquisition section is to accept inputs from the circuit under test and store 32 bits of data along with information from the state/time counters into high-speed memory according to the current setup. Information from the circuit under test is presented to each of the four data probes and the clock probe. Each probe compares the signal from the circuit under test with a fixed threshold voltage. If this signal is above the threshold voltage level, it is considered to be a high; if below this voltage, it is considered to be a low (positive logic). Each probe has a separate threshold circuit which can be set to TTL (a fixed TTL voltage threshold) or to VAR (variable ± 10 volts). The eight signals from each data probe are applied to their respective pod data latches.

8-69. Signals from the clock probe are in two separate groups: (1) the three clocks, J, K, L, and (2) the four qualifiers. The four qualifier signals from the clock probe are applied to the clock slope qualification memory. This memory is loaded by the μ P before the trace begins according to clock qualification and master clock slope selection on the format specification menu. Six outputs from the clock slope qualification memory (one for each slope for each of the three clocks) are applied to the positive/negative slope one-shots along with the three clock signals from the clock probe. Each signal from the clock slope qualification memory defines when a particular slope of a particular clock is qualified. When these are qualified and the slope occurs, the positive/negative slope one-shots will output a single pulse on the corresponding qualified clock line. This clock will latch the appropriate pod data into the pod data latch. Qualified clock signals are ECL and can, therefore, be put into a wired OR configuration by simply tying two of the lines together; this is used in the clock ORing circuit. The other two lines from the clock slope qualification memory define which clock is to be used as the master clock. These two lines and the three qualified clock signals go to the master clock selector which selects the appropriate clock for the master data latch and delays this clock so the same transition can clock the pod data latch as well as the master data latch.

8-70. The master clock select also provides two signals for the internal clock strobe generator which generates seven different strobe signals that clock various circuits within the data acquisition section. Each strobe signal has a unique relationship to the master clock and is generated once for every master clock. The write strobe and the measurement strobe can be enabled or disabled with two signals from the post-trace point counter.

8-71. The 32 bits of data in the master data latch are presented to the trigger memory and the high-speed memory. The trigger memory can recognize 10 different trigger conditions simultaneously. The upper 16-bit and

the lower 16-bit trigger conditions are decoded separately; therefore, it requires two lines from the trigger memory to define a single 32-bit trigger condition.

8-72. HCQ1 and HCQ2 (High Count Qualifiers 1 & 2) together define the 32-bit trigger word used in the count state mode. In this mode, both HCQ1 and HCQ2 must be high for the state/time counters to increment. The state/time clock selector selects either the 10-MHz Standard or the index strobe as a clock for the state/time counters; LCT (Low Count Time) is the selecting signal. When LCT is low, the 10-MHz Standard is used; when it is high, the index strobe is used. Outputs of the state/time counters are stored in high-speed memory along with 32 bits of data and HCQ1 and HCQ2.

8-73. TH0 thru 7 and TL0 thru 7 define eight separate 32-bit trigger conditions. These trigger conditions are shared between the sequence terms, trace point terms, and only state terms, depending on the current setup of the trace specification menu. Consequently, there can only be a maximum of eight of these terms specified on the trace specification menu. The sequence term selector selects one of the eight trigger conditions, depending on which sequence or trace point the 1610B is currently looking for. Whenever the selected trigger condition is present, BRC-E will be high. The sequence term occurrence circuit counts out the specified number of occurrences for each sequence term. The sequence term occurrence circuit is allowed to count whenever the BRC-E signal is in the high state and will count out the specified number of occurrences for each sequence term. When it has completed the count of occurrences for that sequence term, the BRC-C signal will go high.

8-74. The sequence address latch holds the current address of the sequence term that the 1610B is looking for. The sequence address bus goes to the data selector, the next sequence address RAM, the sequence term selector, and the sequence term occurrence circuit. The sequence address instructs the sequence term selector which trigger conditions to currently select, the sequence term occurrence circuit which occurrence specification to currently select, and the next sequence address RAM which sequence is currently selected. The next sequence address RAM then puts out three signals which contain the next sequence address and the LSEQ signal. LSEQ goes low when all sequence terms have been found, and the 1610B now begins looking for the trace point term. The sequencing circuit operates as follows: when the TRACE key is pressed, the μ P loads the next sequence address RAM, the sequence term selector, and the sequence term occurrence circuit with data according to the setup on the trace specification menu. It also resets the sequence address latch to zero so the first sequence to be found is at sequence address zero. The sequence term selector then selects the sequence term associated with sequence address zero, and the sequence term occurrence circuit selects the occurrence associated with sequence address zero. While these circuits are

looking for the selected sequence term the selected number of times, the data selector is continuously selecting the same sequence address to be latched into the sequence address latch. When the selected sequence term has occurred the desired number of times, both BRC-E and BRC-C will be high. This selects the output from the next address sequence RAM to be latched into the sequence address latch, so on the next clock cycle, the sequencing circuit will look for the next sequence term. This continues until all sequence terms are found. Now LSEQ will go low, indicating that the trace point term has been selected.

8-75. RSTAME1 and RSTAME2 define the restart term. If restart is enabled (HREN high), the sequence address latch will be reset via the gate input of the data selector when the restart term occurs. The restart term is combined with BRC-E before it is applied to the gate of the data selector, so it is not possible to restart on one of the sequence or trace point terms. Once the sequence address latch is cleared, the circuitry will begin looking for the first sequence term. The restart signals also apply to the restart one-shot which provides a narrow reset pulse to the memory address counter.

8-76. The trace only states ORing circuit, ORs together up to seven trigger terms depending on how many only state terms are specified in the trace specification menu. When one of these terms occurs, the TRC-E signal goes high and enables the trace only state occurrence circuit to count. When this count is equal to the occurrence count specified for the only state specification, TRC-C will go high.

8-77. The gating circuit receives the LSEQ, BRC-C, BRC-E, TRC-C, TRC-E and the terminal count from the memory address counter. The gating circuit controls the PE (Parallel Enable) and CEP (Count Enable Parallel) inputs to the memory address counter. When sequence protect is on, the sequence terms are stored in the very first locations of high-speed memory. During a trace, data is continually written into high-speed memory at the location of the memory address counter. During a trace, when the data acquisition circuitry is searching for the first term of a sequence, the memory address counter will be at zero and data will be continuously stored into location zero of high-speed memory. After the first sequence term has been found the desired number of times, i.e., BRC-E and BRC-C both high, the memory address counter will be enabled to increment to the next location. Thus, the first sequence term will be stored into location zero. The memory address counter will then be at address one and will continue to store data into high-speed memory at this location until the second sequence term has been found the desired number of times. The memory address counter will again be enabled to increment, thus storing the second sequence term in address location one. This will continue until all sequence terms have been found, i.e., LSEQ in the low state. Now the memory address counter will be allowed to increment

whenever a qualified state, i.e., both TRC-C and TRC-E, occurs.

8-78. When every location in high-speed memory has been filled, i.e., memory counter has reached terminal count, the memory address counter will be reloaded with the next address location past where the last sequence term was stored, thus protecting the sequence terms. This is known as memory wraparound, and at this time, the LWAR (Low Wraparound) flag is set. If sequence protect is turned off, the sequence terms are not stored in the first locations of high-speed memory, and the memory address counter is allowed to count on every qualified state; it is also reset to zero at wraparound.

8-79. The gating circuit also decodes the trace point term. When the trace point is latched, TPF will go high and allow the post-trace point counters to count. The post-trace point counters are initially loaded by the μ P when the trace begins, depending on the number of sequence terms specified and whether the 1610B is on start, end, or center trace. When the post-trace point counter reaches its terminal count, the internal clock strobe generators are disabled, thus halting the storage of data into high-speed memory. If end trace is specified, the post-trace point counters are loaded with terminal count. Therefore, when the trace point is found, the post-trace point counters will be at terminal count and data storage will be halted immediately; this leaves the trace point term as the last word stored in high-speed memory. If start trace is specified, the post-trace point counter will be loaded with the number of sequence terms specified. Therefore, it will need to count 64 minus the number of sequence terms specified clocks before the data storage is halted.

8-80. The address multiplexer selects either the memory address counter outputs or the μ P address bus to address high-speed memory. During a trace, high-speed memory is shared between these two inputs. This allows the μ P to read data out of high-speed memory during a trace.

8-81. The trace point address latch latches the address where the trace point was stored into high-speed memory. The present address latch latches the present address where the memory address counter is currently storing information into high-speed memory. The output of the high-speed memory, the trace point address latch, the present address latch, and the four flags can be read by the μ P to determine the status of the data acquisition circuitry and can also be used to acquire the data from high-speed memory. LDMS (Low Disable Measurement Strobe) is derived from the terminal count of the post-trace point counter. This signals the μ P that data storage is complete so the μ P can now read and display all the data in high-speed memory. LPTF (Low Trace Point Found) is the flag which indicates whether the trace point has been found. LWAR indicates to the μ P whether or not data has been stored in every location

of high-speed memory since the trace began, and RSTF (Restart Flag) indicates to the μ P whether the sequence has been restarted. The μ P can also read the four flags from the slow clock detector circuit. These flags indicate if the clock rate on the clock J, clock K, clock L, or the qualified master clock dropped below a fixed rate.

8-82. DATA ACQUISITION BLOCK DIAGRAM TROUBLESHOOTING.

8-83. If it is determined that the data acquisition circuitry has failed, i.e., the trace test does not pass during performance verification, troubleshoot the failure codes

in the following order. If T is the only failure code, the trouble is probably in the state/time clock selector circuitry, so this should be repaired first. A failure code C indicates a problem in the clock circuitry, clock qualification, master clock selection circuitry or slow clock detectors; individual pod failures may then be checked. Troubleshooting is best accomplished by connecting the clock probe and one data probe to the rear-panel clock and data source. Each function on the 1610B may then be tested by setting up various conditions in the format specification and trace specification menus and observing results of the data display on screen after a trace has been run.

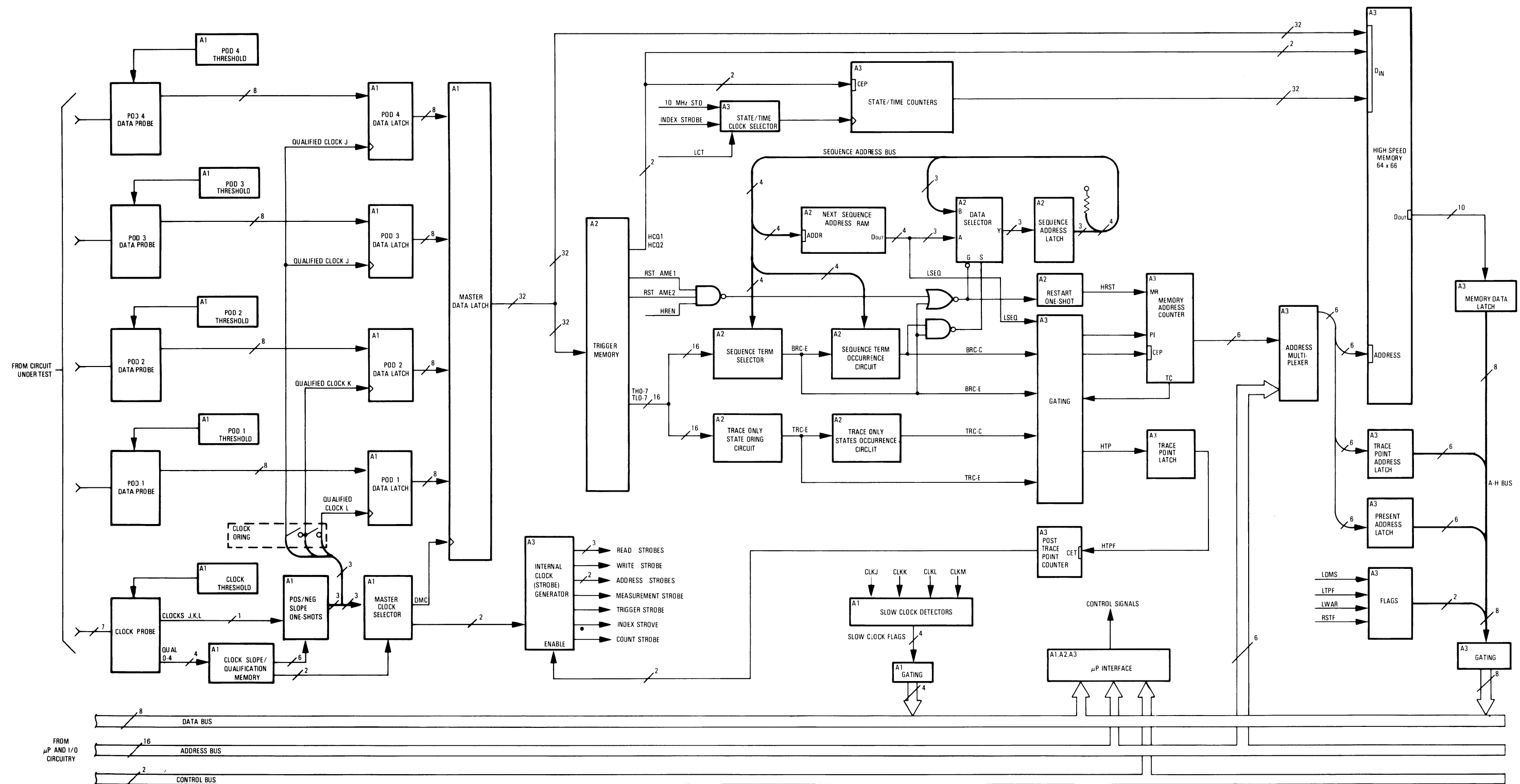


Figure 8-5.
Block Diagram, 1610B Data Acquisition Section
8-17

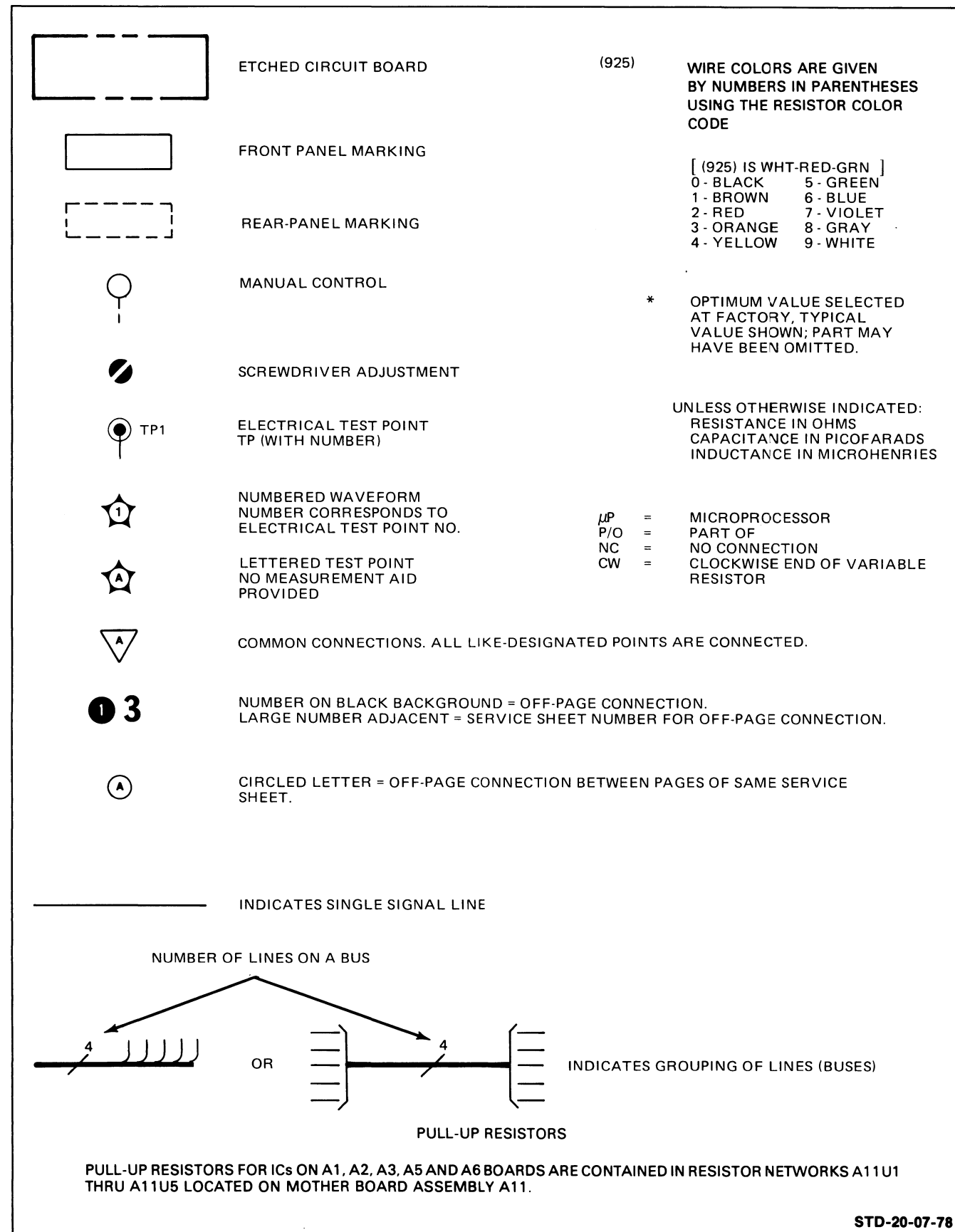
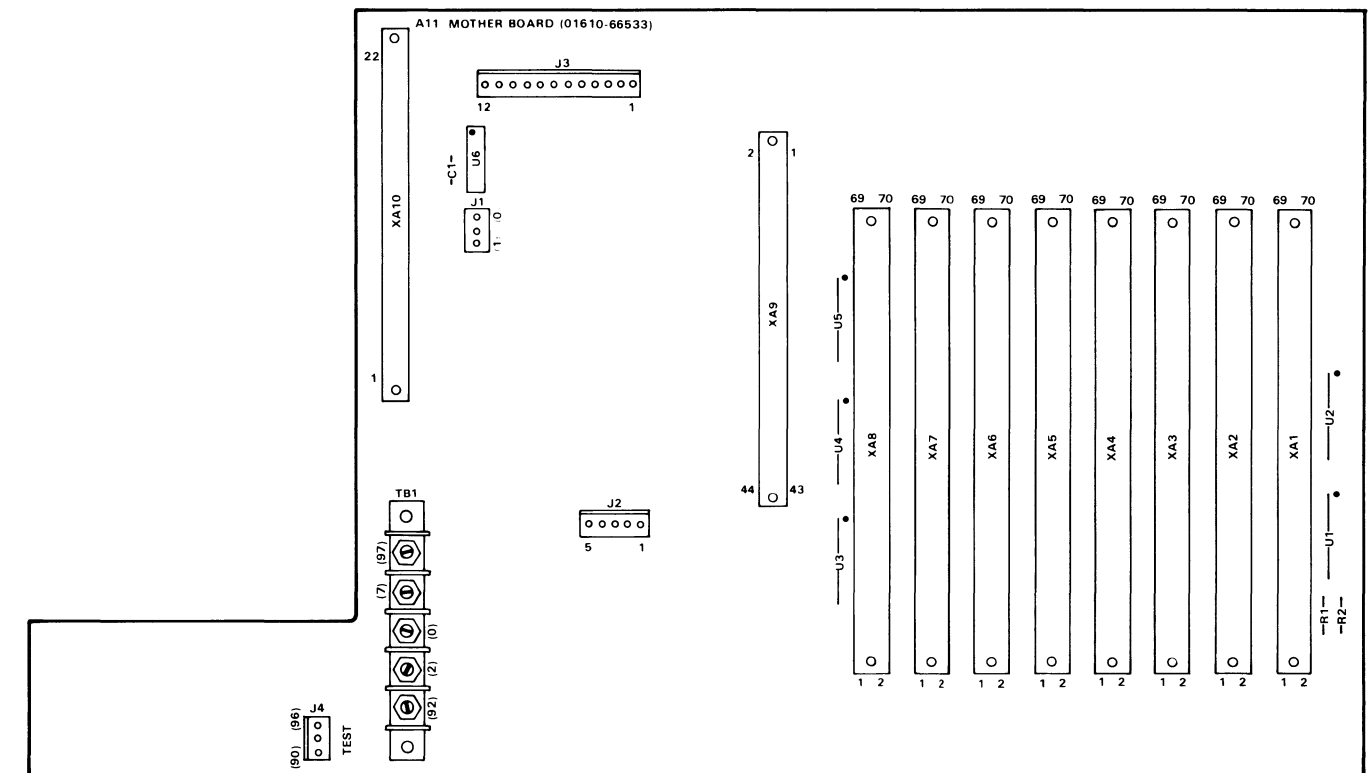


Table 8-2. Schematic Diagram Notes



A11 Component Locations (01610-66533)

Figure 8-6. Service Sheet 1, Mother Board A11 (Sheet 1 of 2)

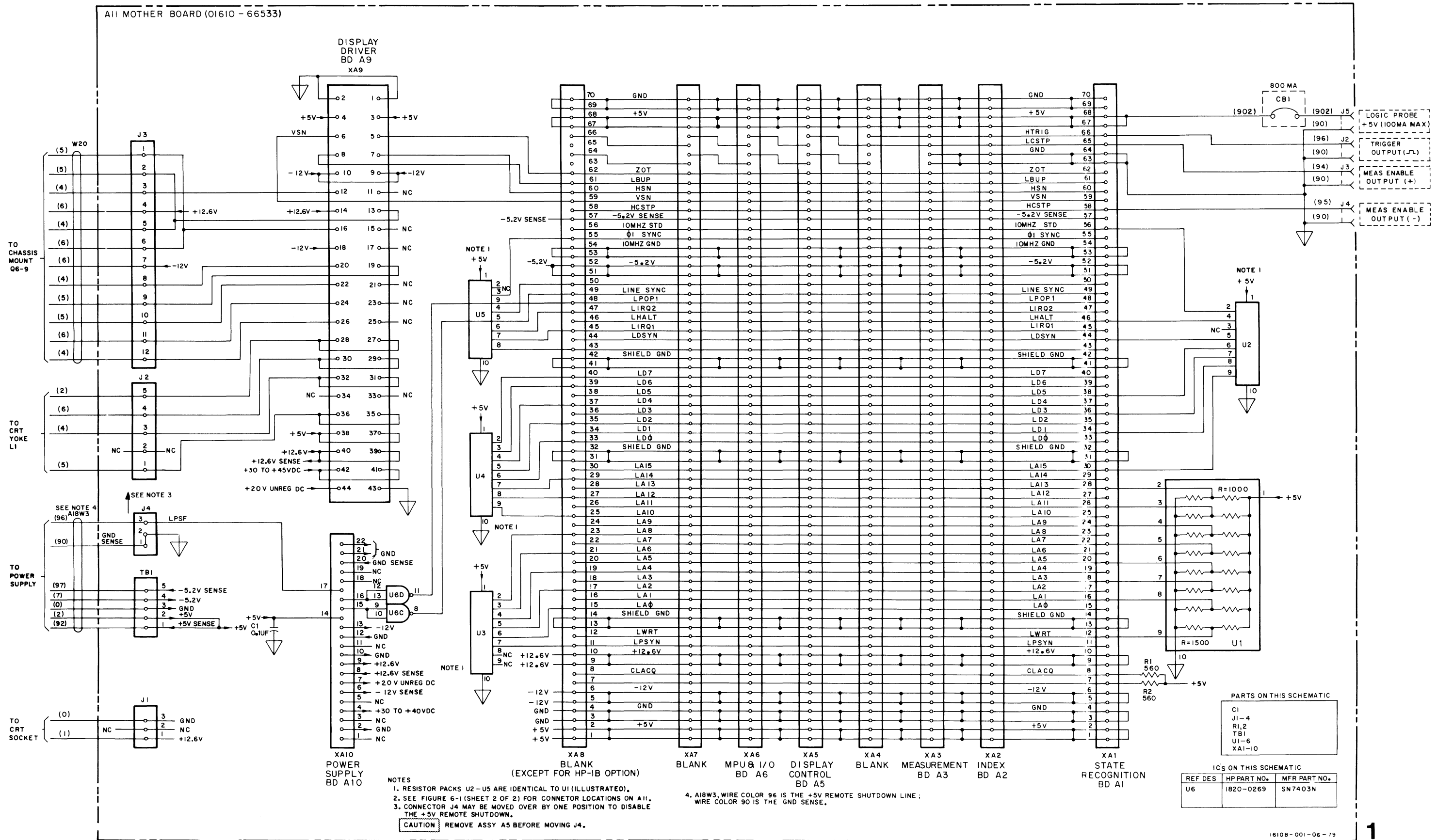
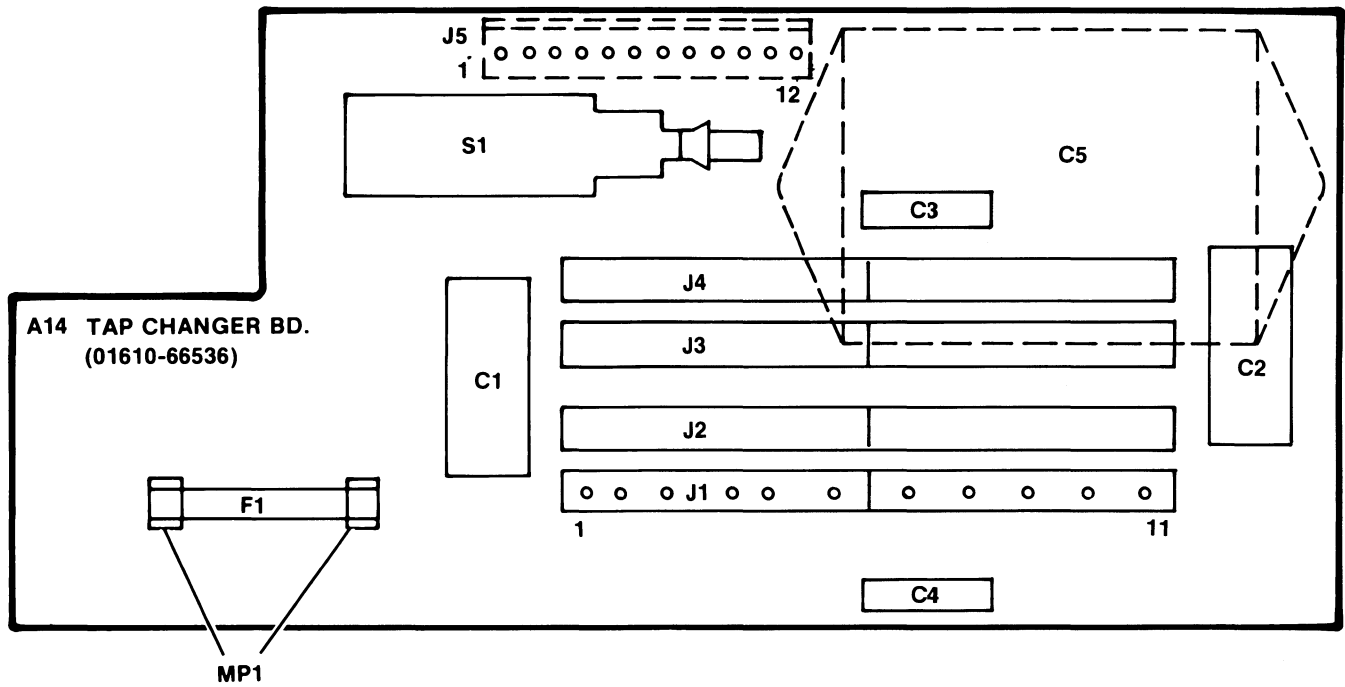


Figure 8-6.
Service Sheet 1, Mother Board A11 (Sheet 2 of 2)
8-19



A14 Component Locations (01610-66536)

Figure 8-7. Service Sheet 2, Tap Changer Board A14 (Sheet 1 of 2)

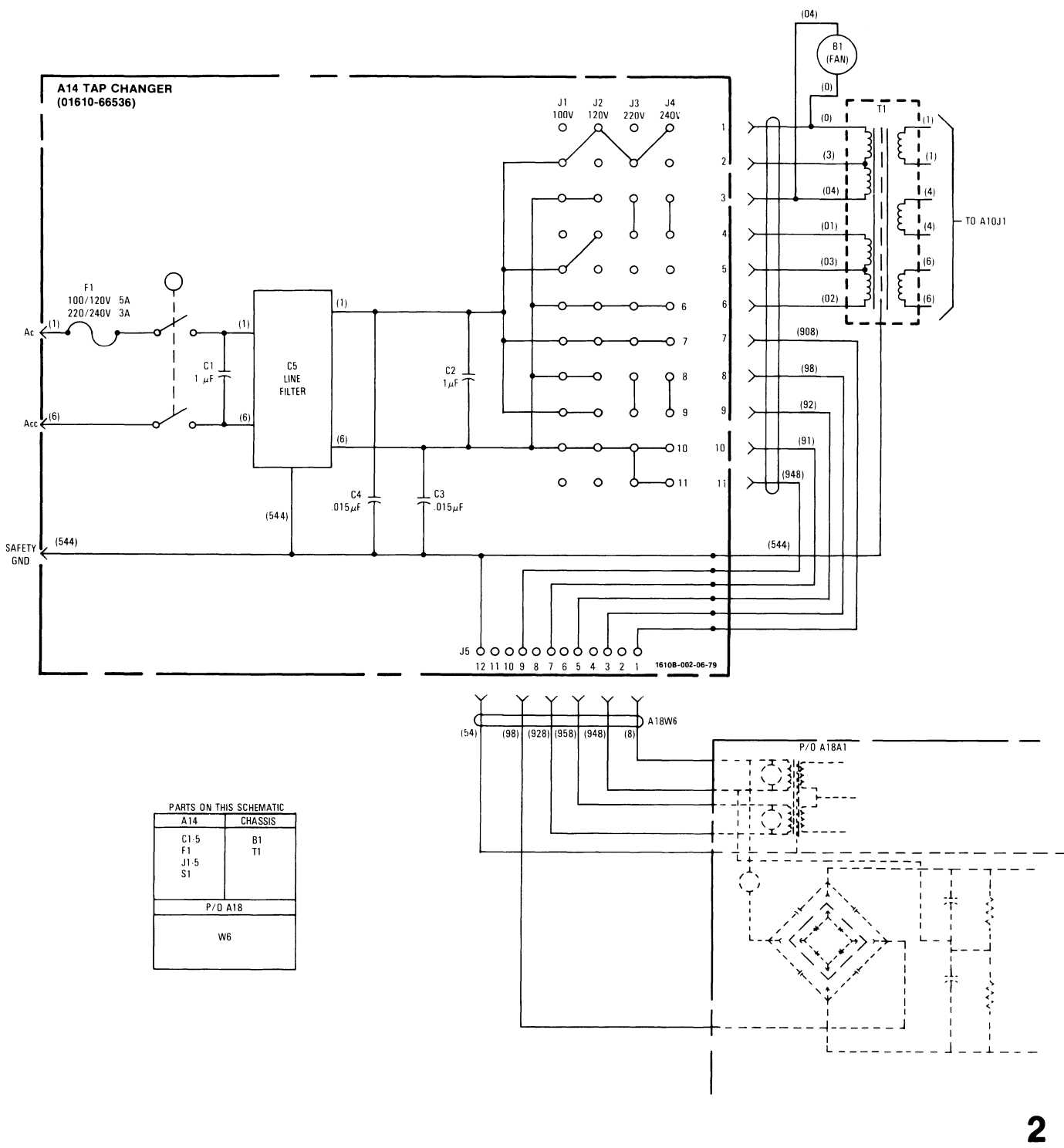
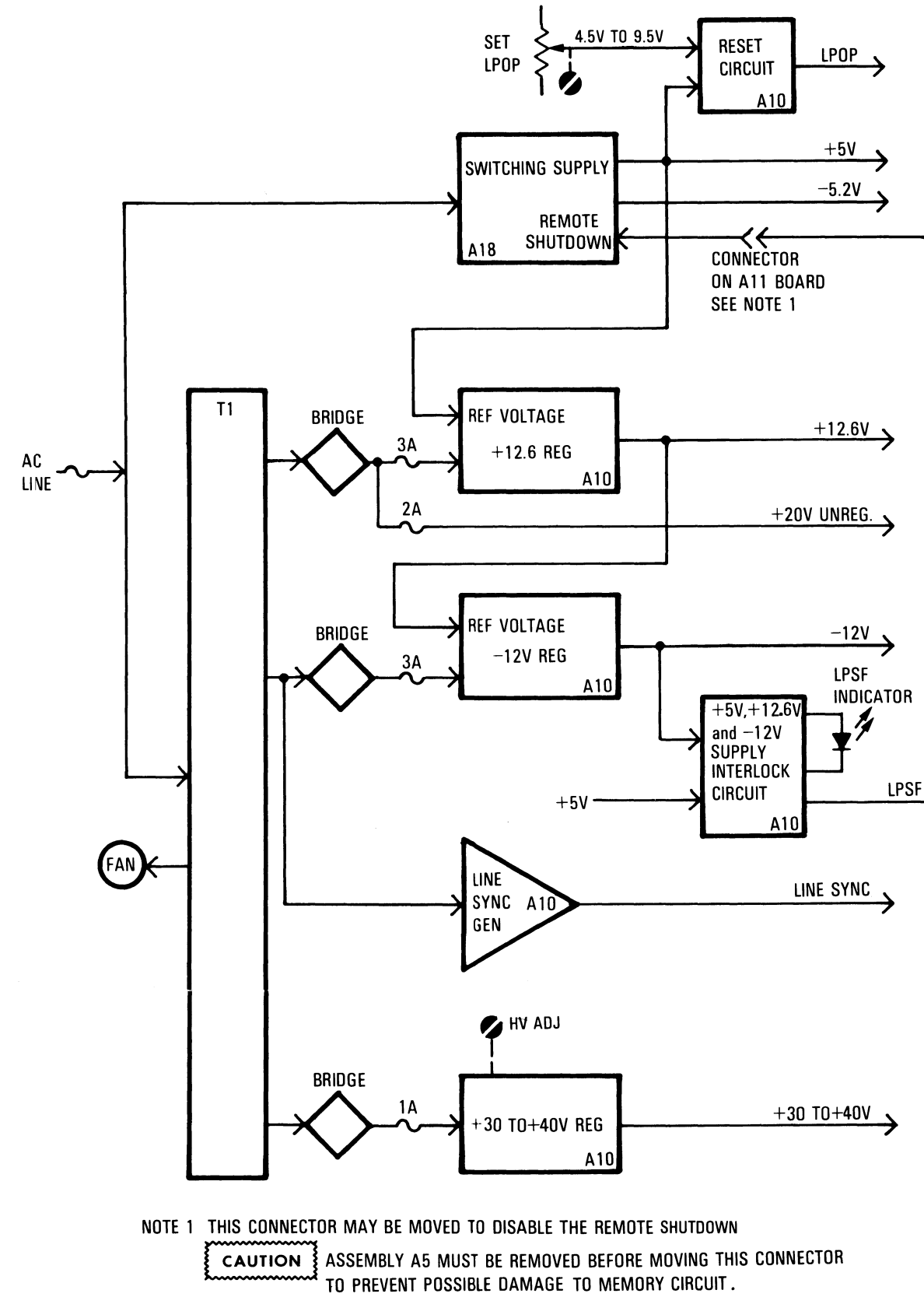


Figure 8-7. Service Sheet 2, Tap Changer Board A14 (Sheet 2 of 2)



Block Diagram, 1610B Power Supply

SERVICE SHEET 3

PRINCIPLES OF OPERATION

Switching Power Supply Description. The switching supply provides +5 V and -5.2 V to the rest of the instrument. The +5 V supply is a true pulse-width modulated switching supply that operates from 25 to 30 kHz while the -5.2 V supply is actually a linear regulator whose unregulated dc input comes from the secondary winding of the +5 V switching transformer. Both supplies have fold-back current limiting and over-voltage crowbar protection circuitry. The +12 volts INT and -12 volts INT are developed for use throughout the switching supply so it can be independent from other supplies in the 1610B. The two internal supplies are developed through T3 whose secondary is full-wave rectified and applied to two, three-terminal regulators, U1 and U2. The outputs of these regulators provide the +12 volt internal and -12 volt internal supplies. A18RV1 and A18RV2 are voltage variable resistors which suppress high-voltage transients and static over-voltage conditions from the ac line input.

The +5 volt pulse-width modulated switching supply operates as follows: the ac line voltage is rectified to provide a ± 160 V which is alternately switched across the primary of switching transformer A18T2 by A18Q2 and A18Q3. The secondary of the transformer is rectified by CR2 and CR3 and filtered by A18A2L2, and A18A2C17; this is the actual +5 V output. It is fed back to the pulse width modulation control circuitry. The pulse width (duty cycle) of the switching transistors is then increased if the voltage is too low or decreased if the voltage is too high.

The ac line voltage is applied to bridge rectifier CR5. This rectifier along with a A18A1C1 and C2 are either connected as a voltage doubler for 110 V operation or as a fullwave bridge rectifier for 220 V operation. Thermal resistor A18A1RT1 is used to reduce high surge currents when power is first applied and A18C1 and C2 are charging.

Pulse-width modulation control circuitry is contained in A18A2U1 which contains such functional components as an oscillator, reference amplifier voltage-sense amplifier, current-limit amplifier, and a dead-time control comparator. The oscillator runs at a fixed frequency (set by R23 and C14), so the oscillator will run between 25 and 30 kHz. The oscillator produces a sawtooth waveform on U1 pin 5 that is used in pulse-width modulation generation.

The reference voltage output (approx 5 Vdc) is used by the +5 volt supply, the remote shutdown, and the crowbar circuitry. The voltage sense amplifier senses the difference between the reference voltage and the present value of the +5 V supply. This voltage is amplified and applied to the comparator where it is compared with the

sawtooth waveform from the oscillator. Depending on the value of the output of the voltage sense amplifier, the output of the comparator will be a fixed pulse width signal. This signal is applied to an AND gate along with the output of the dead-time control comparator. The dead-time control comparator provides a certain amount of time when neither of the switching transistors are on, i.e., dead time. This dead time is determined by comparing a fixed voltage developed through a current source which is fed into R16 and the voltage sawtooth waveform coming from the oscillator. If the remote shutdown is activated, Q2 will turn on and provide a high positive voltage on the input of the dead-time controller. This yields 100% dead time, and the supply will be shut down.

The current sense amplifier senses the voltage drop across current sensing resistor R45. If the voltage drop across R45 becomes too large, the current limit amplifier output voltage will go positive and override the output of the voltage sense amplifier and the pulse width of the signal from the comparator will be decreased proportionally. The output of the AND gate in U1 clocks a T flip-flop and is also applied to two NAND gates which drive output buffer transistors. The T flip-flop alternately selects one of the outputs to be active. These signals are applied to two darlington buffer stages contained in U2 which drive the primaries of two isolation transformers. The output of these transformers drive the base of two transistors which alternately switch the plus and minus 160 volts dc across the primary of A18T2.

The +5 volt crowbar circuit continuously monitors the +5 volt output. If the output goes above approximately +6.3 volts, the crowbar circuit will trip and SCR A18A2Q8 will turn on, thus shorting the output of the supply to ground. At the same time A18A2Q5 will turn on, causing the dead time control to produce 100% dead time. This causes both switching transistors (A18Q2 and A18Q3) to be turned off, thus shutting down both the +5 volt and -5.2 volt supplies. When an overvoltage occurs, the input on pin 2 of U5 will be above the 2.6 volt level. This will turn the transistor off and allow the current source to start charging C10. When C10 charges above the 2.6 volt level, the SCR will be turned on; it will also be turned on if the input on pin 5 is ever at a TTL high which occurs if the -5.2 volt crowbar is ever activated.

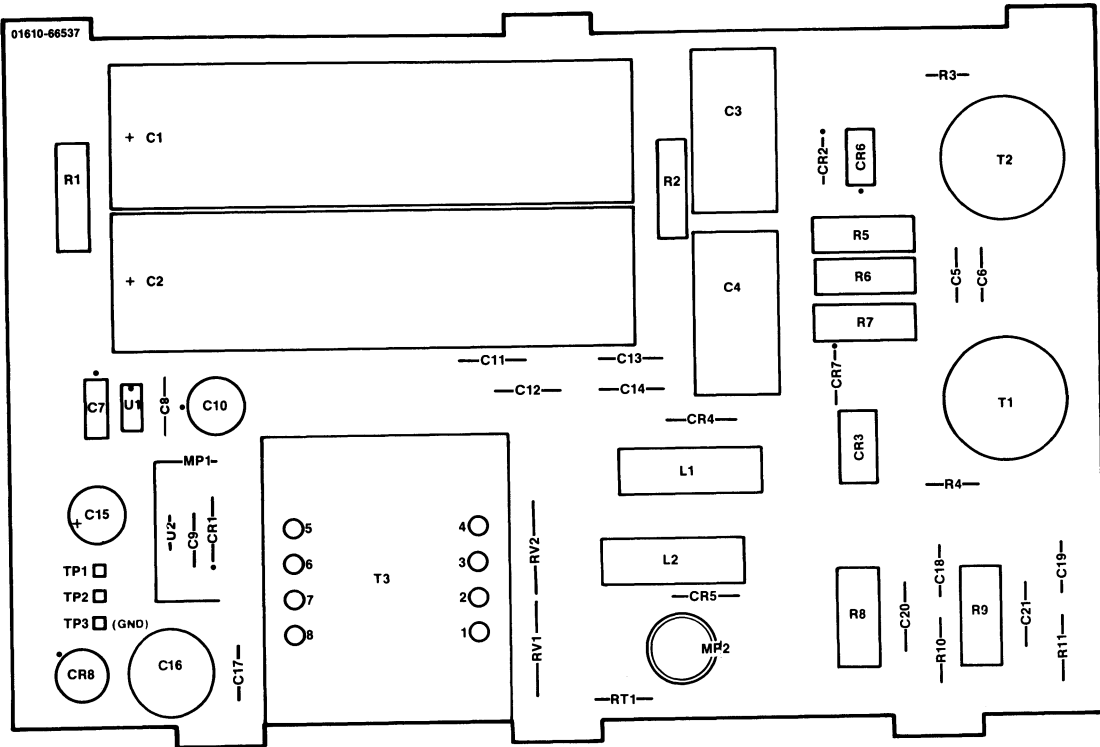
The output of the switching transformer secondary is rectified by CR1 and CR4 to provide the dc input to the -5.2 V regulator. This rectified output is filtered by L3 and C18 which produce approximately -10 V dc. The -5.2 V regulator is contained in U3. The reference voltage is developed through an internal current source (set by resistor R31) and is applied through R29 and R49. R49 is adjusted to give a correct voltage drop to yield an output voltage of -5.2 volts.

Current limit amplifier U4 amplifies the voltage drop across current sensing resistor R46. If the voltage drop becomes too large, the output of U4 will go positive and CR1 will turn on, thus folding back the power supply. The -5.2 volt crowbar circuit works essentially the same as the +5 volt crowbar circuit.

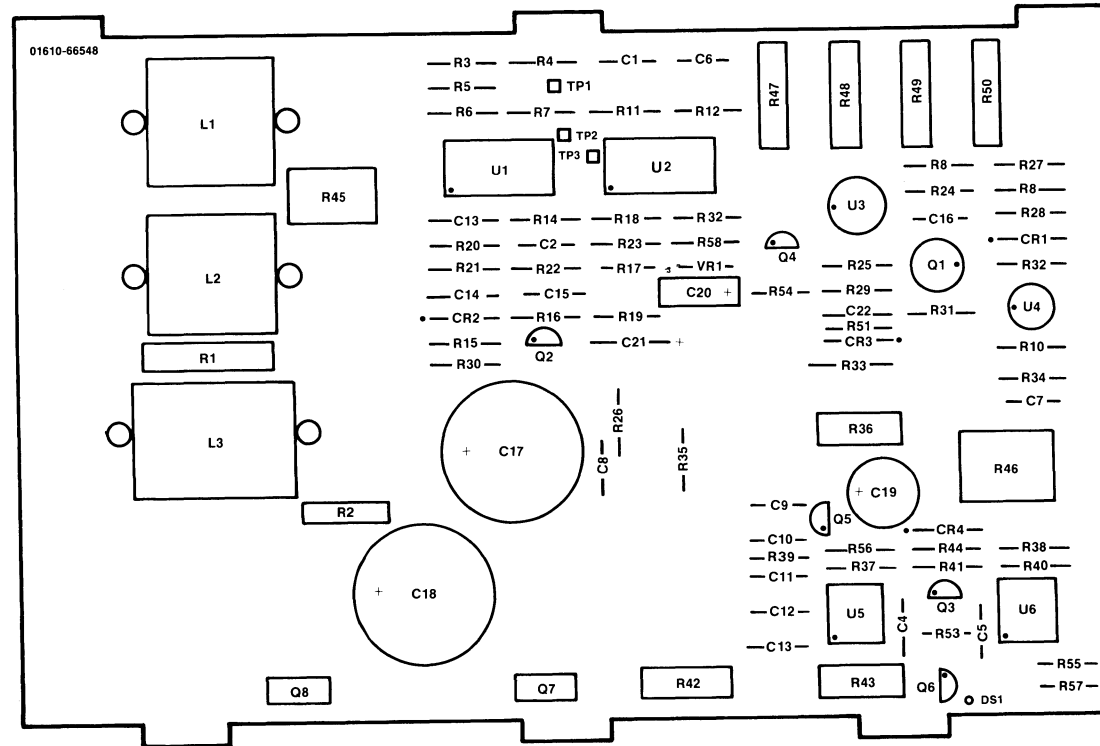
Switching Power Supply Troubleshooting. The +5 volt pulse width modulated section of the switching power supply must be operational before the -5.2 volts power supply will operate. Therefore, the +5 volts pulse width modulated switching supply must be checked and repaired first. The pulse width modulation control circuitry may be tested without applying any ac voltage. Instead, a +15 volt supply should be applied between Test Point 3 (ground) and Test Point 1. This should allow the +12 volt internal supply and the control circuitry to operate. With this voltage applied, waveforms A through G can be checked. When these waveforms are correct, the ac line should be connected to the supply through a Variac. With the +15 volt supply still applied between A18A1TP3 and TP1, the line voltage should be gradually increased while monitoring the line current. If excessively high current does occur, waveform H should be monitored. If this waveform is excessively large, a short on the secondary of A18T2 should be expected. If this waveform is not excessively large, the input line rectification circuitry should be checked. When the +5 volt portion of the switching supply is fully operational, the -5.2 volt supply may then be checked.

The following procedure should be followed to check for a crowbar condition. LED A18A2DS1 will be on when the -5.2 volt supply has crowbarred and will shut down both supplies. If LED A18A2DS1 is off, then the A10 board should be removed and pin 4 of A18A2U1 should be checked. If pin 4 is high then the +5 volt supply has crowbarred.

Certain power supply functions may be disabled to help in problem isolation. When disabling these various circuits, the power supply outputs should be disconnected from the 1610B to prevent damage to certain components. Both power supplies may be brought up without an external load. Various circuit functions may be disabled as follows: the remote shutdown feature may be disabled by lifting one end of A18A2R19; the +5 volts current limit may be disabled by lifting one end of A18A2R3; the -5 volt current limiting may be disabled by lifting one end of both A18A2R27 and R28.



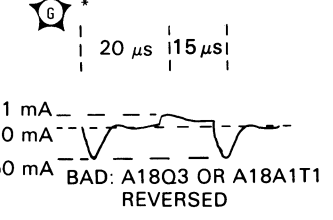
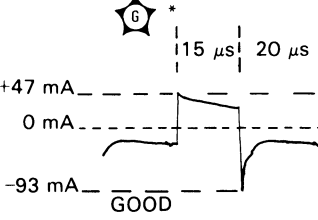
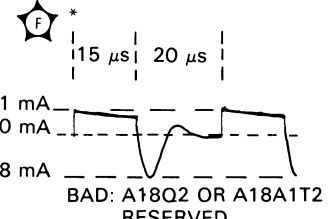
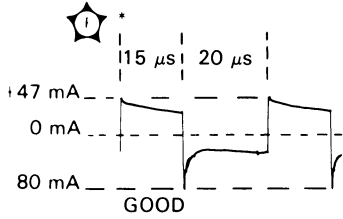
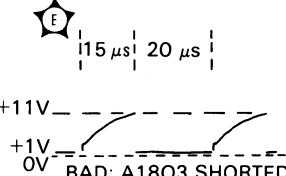
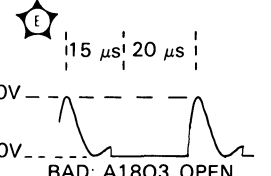
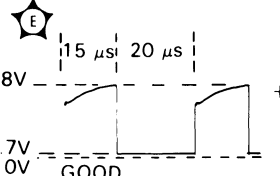
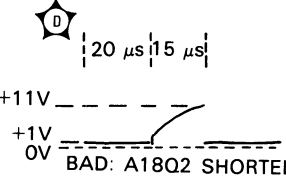
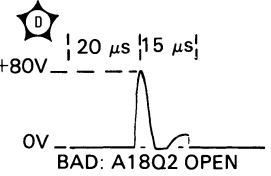
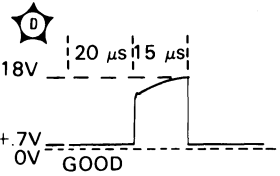
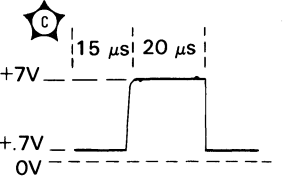
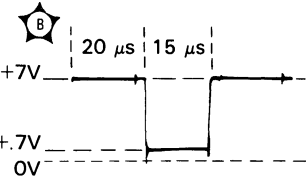
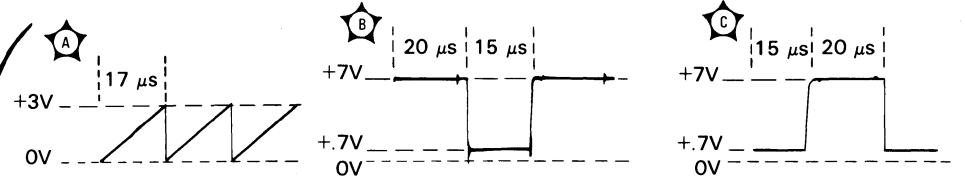
A18A1 Component Locations (01610-66537)



A18A2 Component Locations (1610-66548)

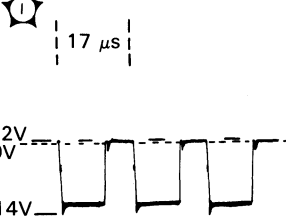
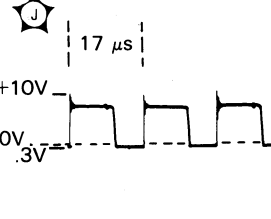
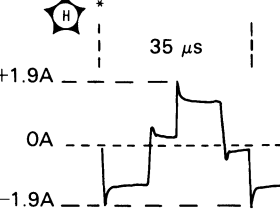
TEST CONDITIONS FOR WAVEFORMS A THROUGH G

1. NO AC POWER APPLIED.
2. A +15V TO +30V SUPPLY AT APPROX 200mA CONNECTED BETWEEN A18A1TP1 AND A18A1TP GND.
3. NO LOAD ON +5V or -5.2V OUTPUTS.



TEST CONDITIONS FOR WAVEFORMS H THROUGH J

1. FULL AC LINE VOLTAGE APPLIED.
2. +5V AND -5.2V MUST BE CONNECTED TO THE 1610B AND ALL BOARD ASSEMBLIES INSTALLED.



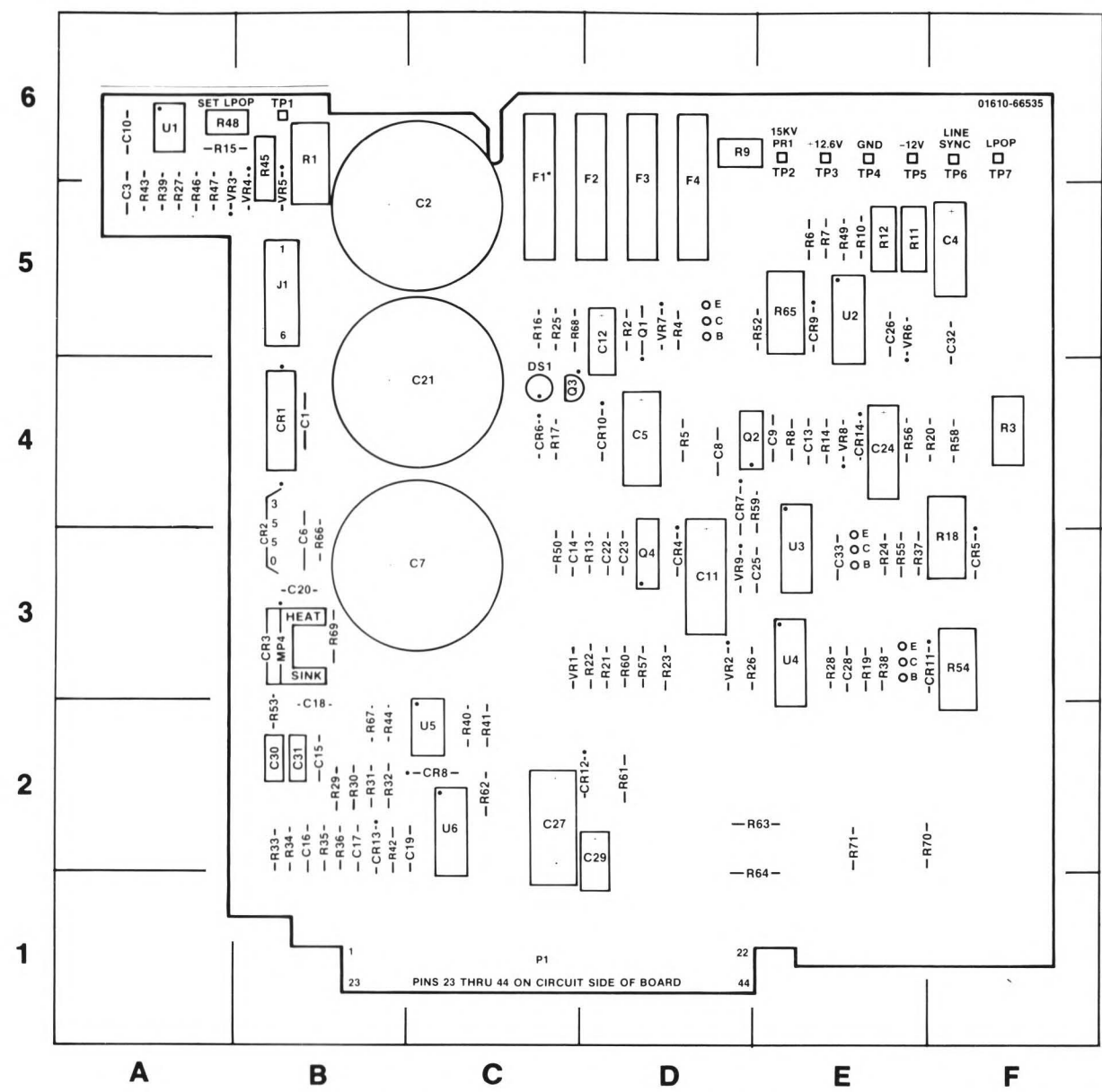
*NOTE: AN HP 1110A AC CURRENT PROBE MAY BE USED FOR THESE WAVEFORMS. WHEN TERMINATED INTO 50 OHMS, OUTPUT WILL YIELD 3.1 AMPS/VOLT.

Waveforms for Schematic 3

Figure 8-8. Service Sheet 3, 5-Volt Power Supply A18 (Sheet 2 of 3)

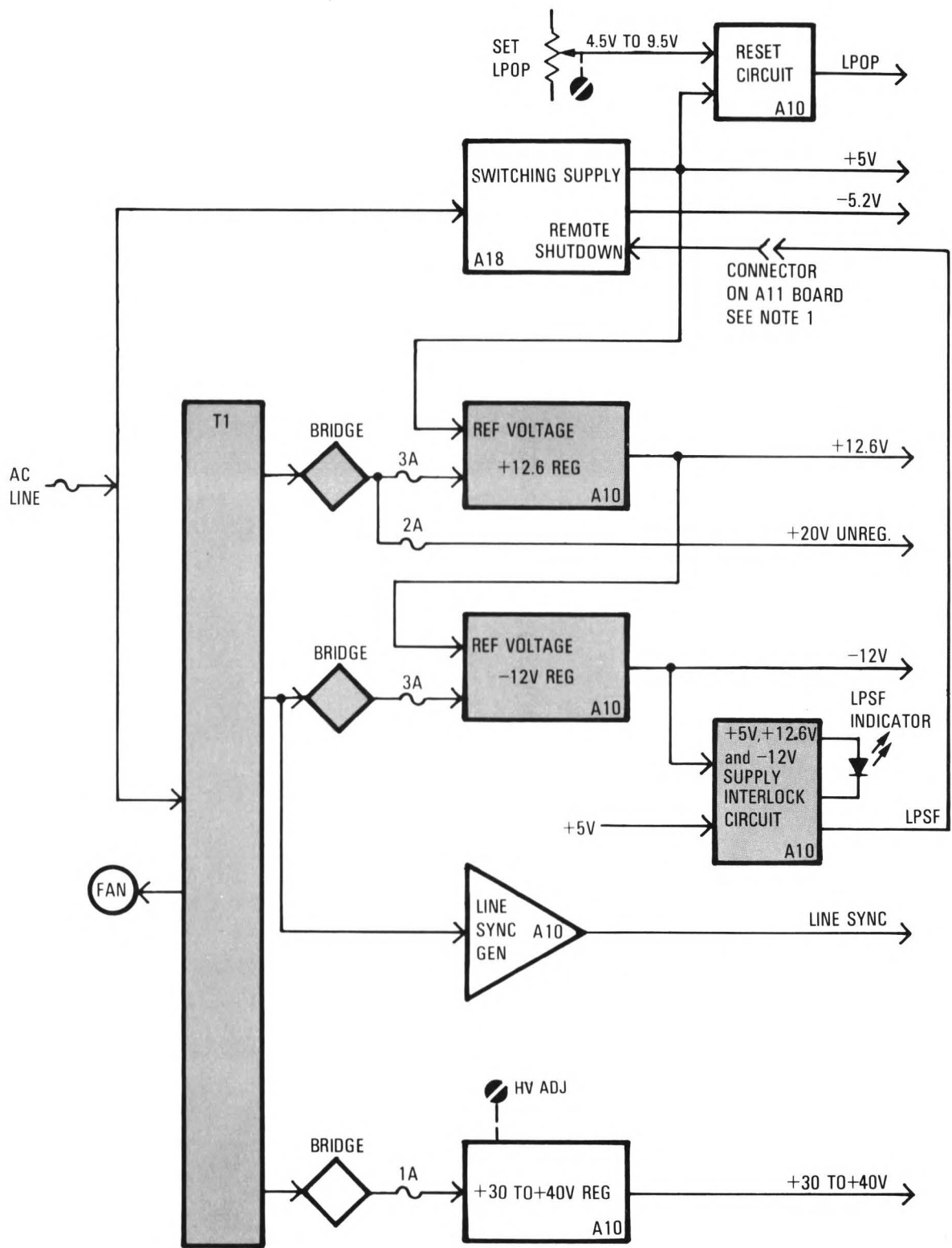


8-23



A10 Component Locations (01610-66535)

REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	B-4	C20	B-3	CR9	E-5	R3	F-4	R22	D-3	R41	C-2	R61	D-2	U2	E-5
C2	C-5	C21	C-4	CR10	D-4	R4	D-5	R23	D-3	R42	B-2	R62	C-2	U3	E-3
C3	A-5	C22	D-3	CR11	F-3	R5	D-4	R24	E-3	R43	A-5	R63	E-2	U4	E-3
C4	F-5	C23	D-3	CR12	D-2	R6	E-3	R25	C-5	R44	B-2	R64	E-2	U5	C-2
C5	D-4	C24	E-4	CR13	B-2	R7	E-5	R26	E-3	R45	B-6	R65	E-5	U6	C-2
C6	B-3	C25	E-3	CR14	C-3	R8	E-4	R27	A-5	R46	A-5	R66	B-3	VR1	C-3
C7	C-3	C26	E-5	F1	C-5	R9	D-6	R28	E-3	R47	A-5	R67	B-2	VR2	D-3
C8	D-4	C27	C-2	F2	D-5	R10	E-5	R29	B-2	R48	A-6	R68	C-5	VR3	A-6
C9	E-4	C28	E-3	F3	D-5	R11	E-5	R30	B-2	R49	E-5	R69	B-3	VR4	B-6
C10	A-6	C29	D-2	F4	D-5	R12	E-5	R31	B-2	R50	C-3	R70	E-2	VR5	B-6
C11	D-3	C30	B-2	J1	B-5	R13	D-3	R32	B-2	R52	E-5	R71	E-2	VR6	E-5
C12	D-5	C31	B-2	MP4	B-3	R14	D-4	R33	B-2	R53	B-2	TP1	B-6	VR7	D-5
C13	E-4	CR1	B-4	P1	B-1-D-1	R15	A-6	R34	B-2	R54	F-3	TP2	E-6	VR8	E-4
C14	C-3	CR3	B-3	Q1	D-5	R16	C-5	R35	B-2	R55	E-3	TP3	E-6	VR9	D-3
C15	B-2	CR4	D-3	Q2	D-4	R17	C-4	R36	B-2	R56	E-4	TP4	E-6	DS1	C-4
C16	B-2	CR5	F-3	Q3	C-4	R18	F-3	R37	E-3	R57	D-3	TP5	E-6		
C17	B-2	CR6	C-4	Q4	D-3	R19	E-3	R38	E-3	R58	F-4	TP6	F-6		
C18	B-2	CR7	D-4	R1	B-6	R20	F-4	R39	A-5	R59	E-4	TP7	F-6		
C19	C-2	CR8	C-2	R2	D-5	R21	D-3	R40	C-2	R60	D-3	U1	A-6		

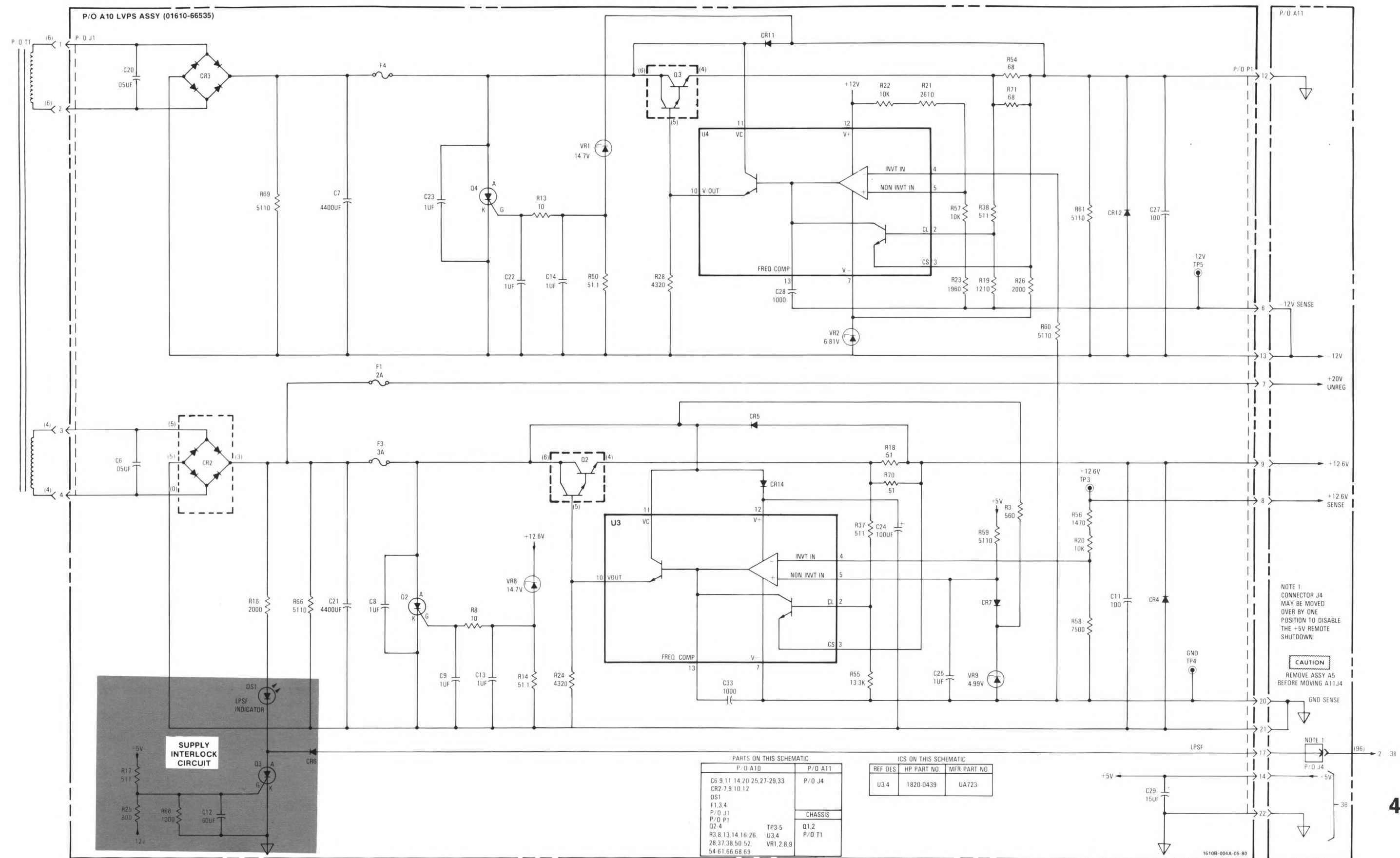


NOTE 1 THIS CONNECTOR MAY BE MOVED TO DISABLE THE REMOTE SHUTDOWN

CAUTION ASSEMBLY A5 MUST BE REMOVED BEFORE MOVING THIS CONNECTOR TO PREVENT POSSIBLE DAMAGE TO MEMORY CIRCUIT.

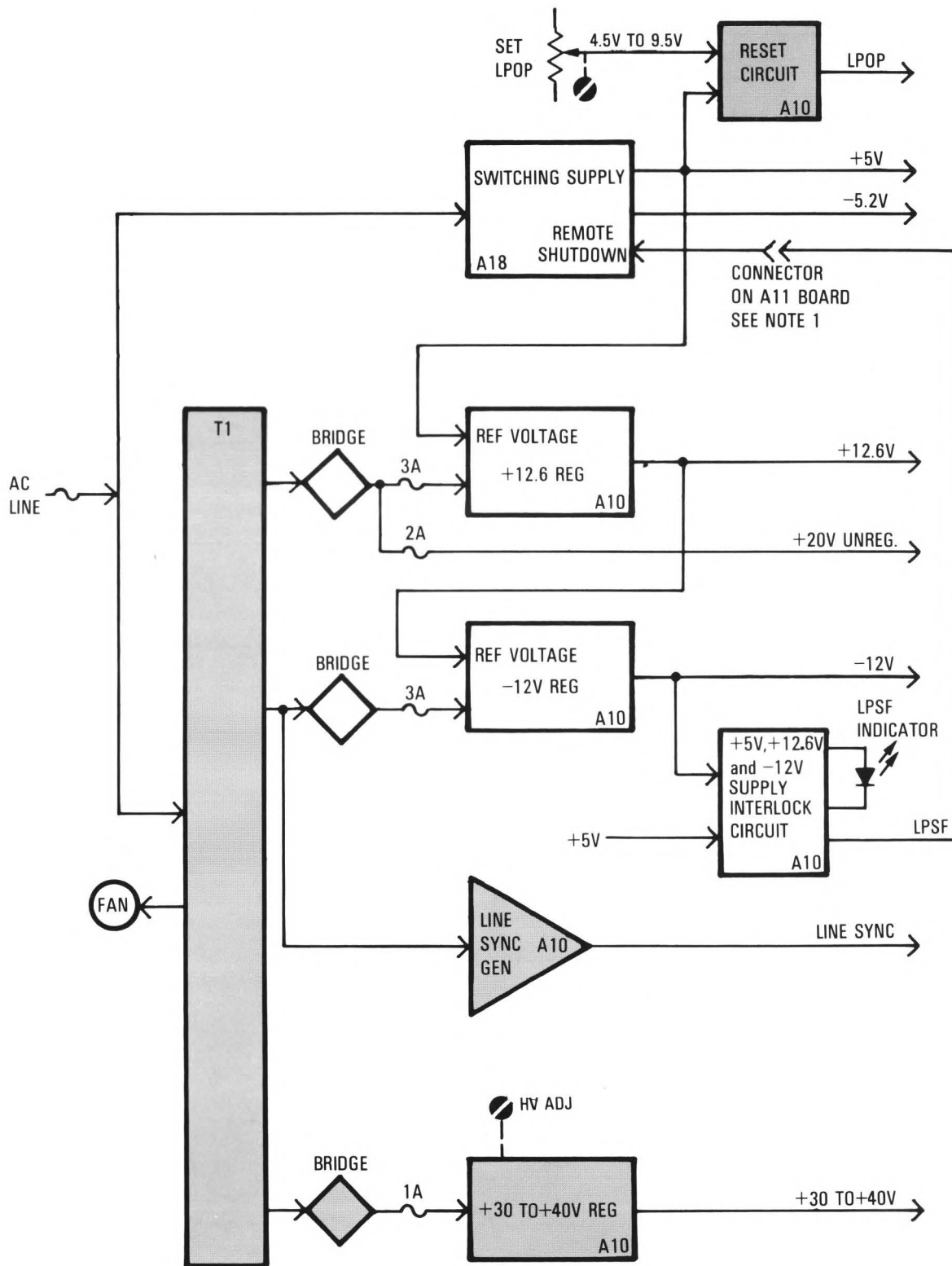
Block Diagram, 1610B Power Supply

Figure 8-9. Service Sheet 4, Low-Voltage Power Supply Board A10 (Sheet 1 of 4)



4A

Figure 8-9.
Service Sheet 4, Low-Voltage Power Supply Board A10 (Sheet 2 of 4)
8-25



NOTE 1 THIS CONNECTOR MAY BE MOVED TO DISABLE THE REMOTE SHUTDOWN

CAUTION

ASSEMBLY A5 MUST BE REMOVED BEFORE MOVING THIS CONNECTOR TO PREVENT POSSIBLE DAMAGE TO MEMORY CIRCUIT.

Block Diagram - 1610B Power Supply

Figure 8-9. Service Sheet 4, Low-Voltage Power Supply Board A10 (Sheet 3 of 4)

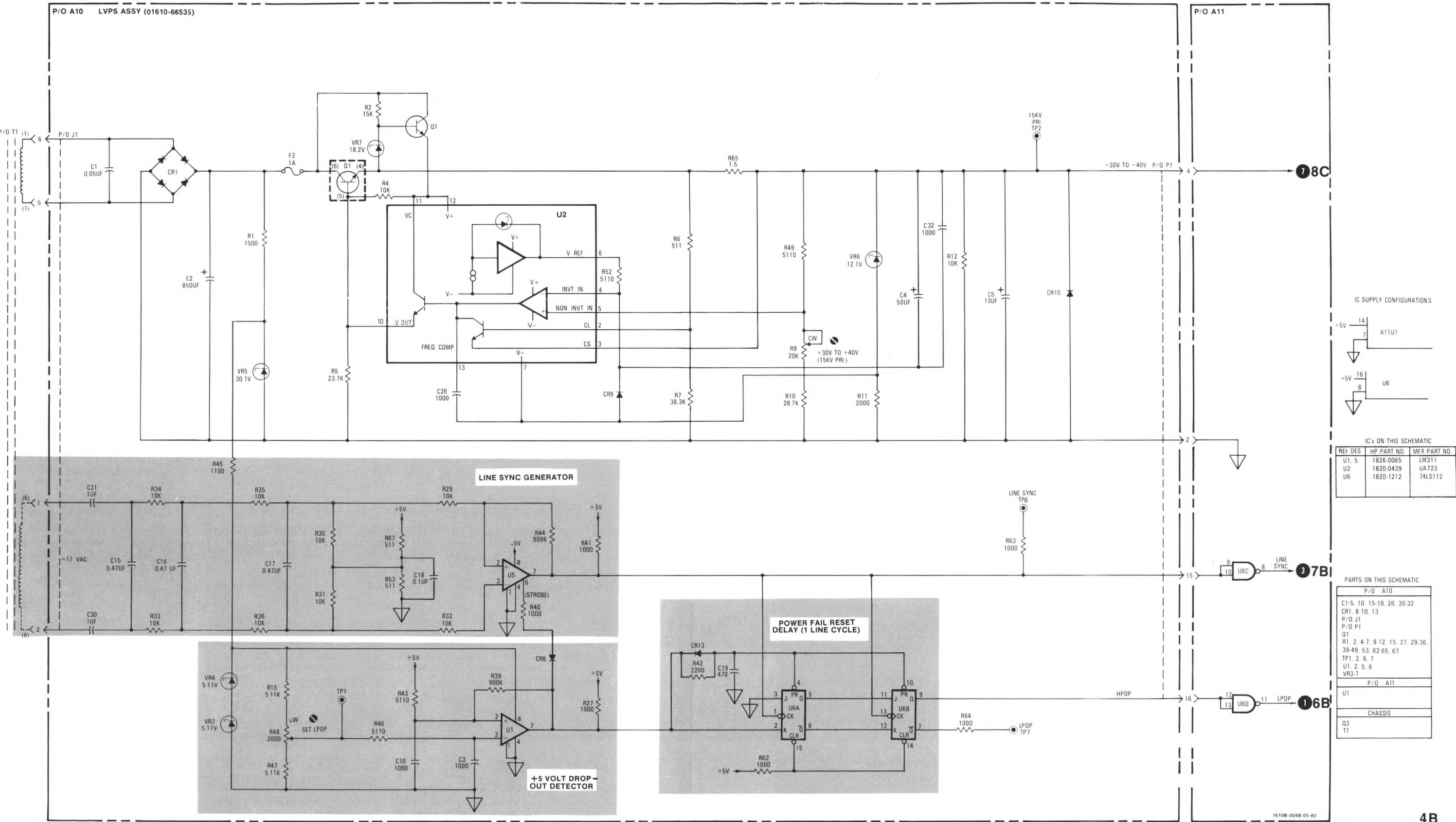


Figure 8-9.
Service Sheet 4, Low-Voltage Power Supply Board A10 (Sheet 4 of 4)
8-27

SERVICE SHEET 5

PRINCIPLES OF OPERATION

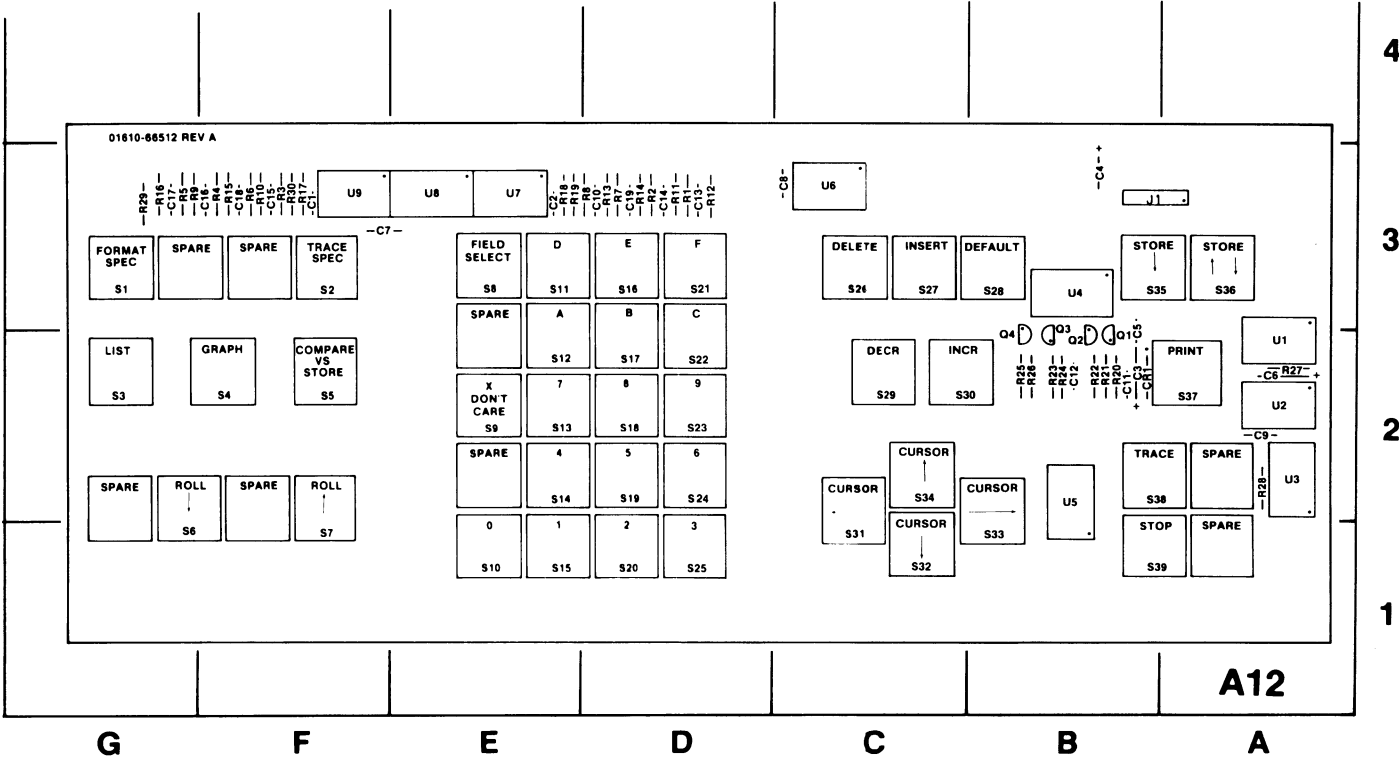
Each switch in the 1610B keyboard has a magnetic core which is normally saturated, but becomes unsaturated when a key is depressed. The indication of whether the key is depressed or not is determined by the change in mutual inductance between a sense and a drive winding. Applying a current ramp to the drive line results in a voltage pulse on the output. $V=L (DI/DT)$.

The keyboard switches are scanned by means of a multiplexer and a decoder driver (both driven by a current source; the multiplexer scans the rows. When a key is found to be depressed, the scanning of the keys is stopped until the keyboard is read, and the key is released.

Counter U5 determines which column is selected by decoder U4. This counter changes state on the trailing edge of LPSYN after a complete row scan by counter U6. U4 selects a column, and on the leading edge of LPSYN a ramped current is applied to a node connected to all of the columns. The column selected is determined by the decoder output which is low at the time.

The output of each sense line drives integrator U7/U9. When a key is depressed and the ramped current is going through its column, the integrator receives a positive voltage pulse on its input. This results in a low-going output which is detected when multiplexer U8 selects its row. The row detected is determined by counter U6. When a key is detected, feedback is used to increase the bias on the common node of the integrators. This creates hysteresis, so less input is required to have a valid output. It also ensures that multiple readings of the switch will not occur due to small vibrations when the switch is pressed or released.

The output of U8 will go positive when the switch in the selected row and column is depressed. This positive pulse triggers monostable U1. The output of U1 disables the clock to counter U6 preventing further scanning. The output of U1 is also used to indicate the key-down condition. The negative transition of the inverted output of U1 sets new key flip-flop U3B which indicates that a new key has been detected and has not yet been read. The U3B output prevents scanning until the keyboard is read. After the keyboard is read, the LRDKB line is pulsed low. This sets read key flip-flop U3A which clears U3B. As long as the key is held down, monostable U1 is continually retriggered. Approximately 14 ms after the key is released, U1 times out and enables LPSYN to continue scanning if the key has been read and U3B is cleared. LPOP, in a similar manner to LRDKB, clears the new key flip-flop during powerup.



A12 Component Locations (01610-66512)

REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	F-3	C14	D-3	R2	D-3	R15	F-3	R28	A-2	S11	E-3	S24	D-2	S37	A-2
C2	E-3	C15	F-3	R3	F-3	R16	G-3	R29	G-3	S12	E-2	S25	D-1	S38	B-2
C3	B-2	C16	F-3	R4	F-3	R17	F-3	R30	F-3	S13	E-2	S26	C-3	S39	B-1
C4	B-3	C17	G-3	R5	G-3	R18	E-3	S1	G-3	S14	E-2	S27	C-3	U1	A-2
C5	B-2	C18	F-3	R6	F-3	R19	E-3	S2	F-3	S15	E-1	S28	B-3	U2	A-2
C6	A-2	C19	D-3	R7	D-3	R20	B-2	S3	G-2	S16	D-3	S29	C-2	U3	A-2
C7	F-3	CR1	B-2	R8	D-3	R21	B-2	S4	F-2	S17	D-2	S30	C-2	U4	B-3
C8	C-3	J1	B-3	R9	G-3	R22	B-2	S5	F-2	S18	D-2	S31	C-1	U5	B-2
C9	A-2	Q1	B-2	R10	F-3	R23	B-2	S6	G-1	S19	D-2	S32	C-1	U6	C-3
C10	D-3	Q2	B-2	R11	D-3	R24	B-2	S7	F-1	S20	E-1	S33	B-1	U7	E-3
C11	B-2	Q3	B-2	R12	D-3	R25	B-2	S8	E-3	S21	D-3	S34	C-2	U8	E-3
C12	B-2	Q4	B-2	R13	D-3	R26	B-2	S9	E-2	S22	D-2	S35	B-3	U9	F-3
C13	D-3	R1	D-3	R14	D-3	R27	A-2	S10	E-1	S23	D-2	S36	A-3		

Figure 8-10. Service Sheet 5, Keyboard Assembly A12 (Sheet 1 of 2)



Figure 8-10.

SERVICE SHEET 6

PRINCIPLES OF OPERATION

MPU/IO Board A6 has several functions. The 6800 MPU (U26, Schematic 6B) controls operation of the machine. It requires a two-phase clock which is generated from signals received from Display Control Board A5 (see Service Sheet 7). The MPU will respond to a power-up input, non-maskable interrupt input (used to initiate self test), and a maskable interrupt input (used for the delta timer). There are four general areas of addressing in the 1610B: RAM on the display controller board (0000-0FFF), I/O (1000-100F), acquisition (1800-1FFF), and ROM (4000-7FFF). The MPU controls these area via 16 address, 8 data, LPSYN, and read/write lines. The LPOP line initializes all appropriate functions when a power-up sequence occurs.

MPU CLOCK (Schematic 6A). The 6800 MPU's clock is a 2 phase, 0.5 MHz clock, generated on the MPU/IO board. Inputs are a 10 MHz clock and a phase 1 SYNC line from the display controller board (see Schematic 7A).

The 10 MHz clock from the display controller is divided to 5 MHz by flip-flop U27A. This 5 MHz signal is then used to clock counter U40. U40 divides by 10 by counting through states 4-13 and toggles U27B so that the phase signals are alternately produced. Φ1 SYNC performs two functions: as the J input to U27A, it ensures correct phasing of the 0.5 MHz signal; it also correctly phases the count of U40. The counter is held off by its CEP and CET inputs when it reaches state 12 until Φ1 SYNC is present.

The Q(D) output of counter U40 is delayed by U27B. Q(D), Q(D) delayed, and their complements are then combined to create the phase 1 and phase 2 non-overlapping clocks. Clock driver U25 provides the required signals to the MPU.

MPU AND BUS CONTROL (Schematic 6B). The read/write line indicates which operation is being performed during the LPSYN pulse: LIRQ1 is the maskable (delta timer) interrupt input, LIRQ2 is the non-maskable (self test) interrupt input, and LPOP is the restart (power-up) input.

The MPU is the only driver on the address bus. It both receives and drives the data bus.

The phase 2 delayed signal is ANDed with VMA (Valid Memory Address) to create LPSYN. During the period this line is low, the address bus is valid. When it goes high, data is latched from the bus.

When LPOP is pulsed low during a power-up cycle, the RST MPU input is also pulsed low. This causes the MPU to fetch its restart ADDRESSES and begin program execution.

When the LIRQ2 (NMI-performance verification button) line is pulled low, this simultaneously pulls down LPOP and RST and forces the MPU NMI input high. When the performance verification button is released, LPOP and RST go high, initiating a power-up cycle. Delayed by approximately 80 nanoseconds, the NMI MPL input goes low causing the MPU to execute a non-maskable interrupt, which vectors program control to self test. The LIRQ2 line is debounced by C46 and R37.

The LIRQ1 (delta timer) interrupt line is a buffered input to the IRQ (maskable interrupt) input.

HDBE and R/W control the operating direction of U32/33 (bidirectional bus drivers). If a write is in process, the HWRT line causes U32/33 to drive the bus. If read is in process, HWRT prevents U32/33 from driving the bus, and if HDBE is high (not phase 1), U32/33 are driving the MPU inputs.

ROM CIRCUIT (Schematic 6B). The ROMs on the MPU board are addressed from 4000-7FFF. The last 2K are also imaged by F000-FFFF. This is required for the power-up and interrupt vectors.

Decoder U37 decodes address bits 11-13 and selects one of five ROM packs. All ROMs have images every 4000 but the data is only enabled to the bus when valid ROM addresses are received.

U44 and U45 detect that a correct address has been decoded (4000-7FFF, F800-FFFF), LPSYN is true, and it is a read operation. This output then enables the ROM data outputs through the open-collector NAND gates to the bus.

I/O CIRCUITRY (Schematic 6C). The I/O circuitry decodes addresses 1000 through 100F to control printer, keyboard, beeper, delta timer, and probe driver operations.

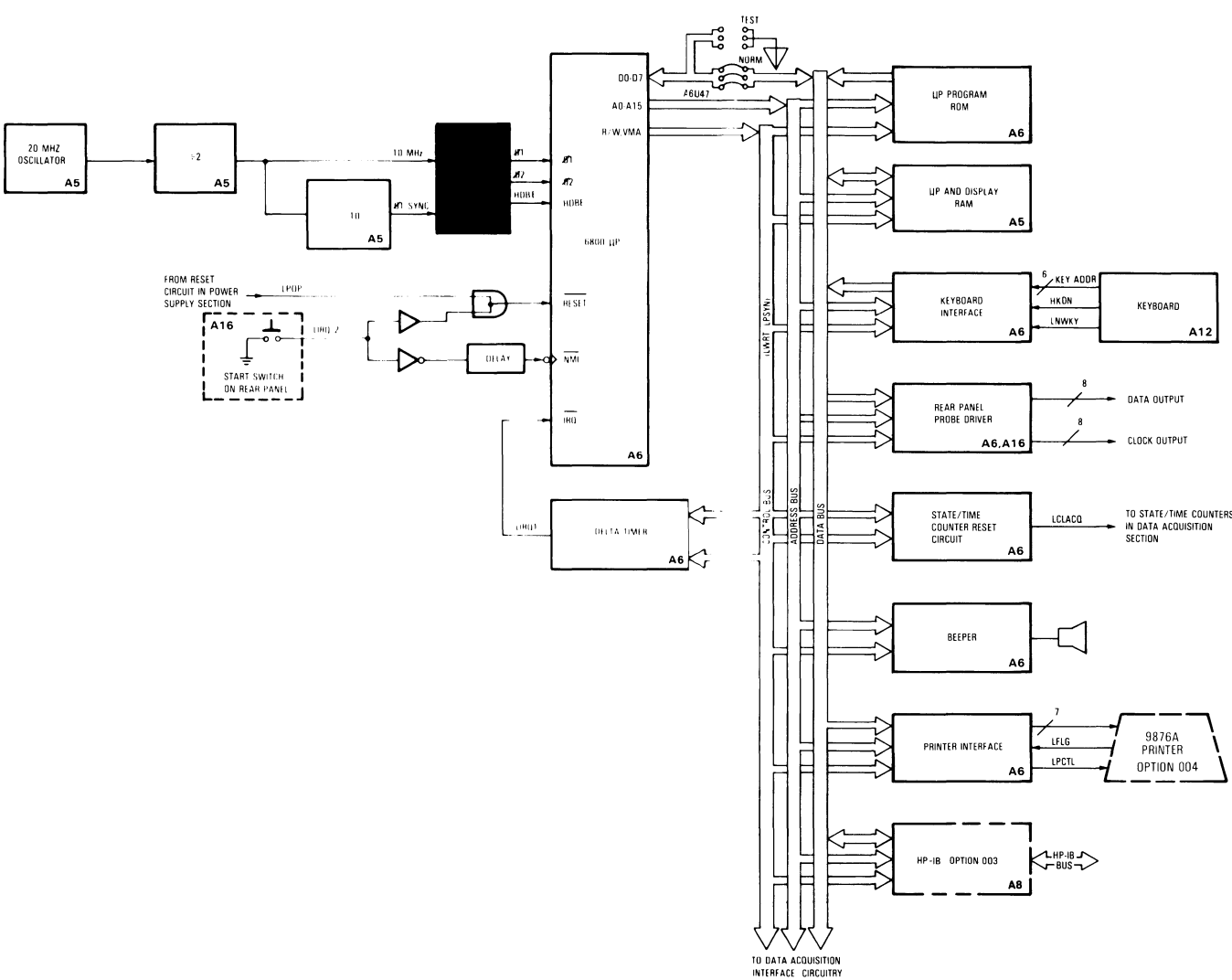
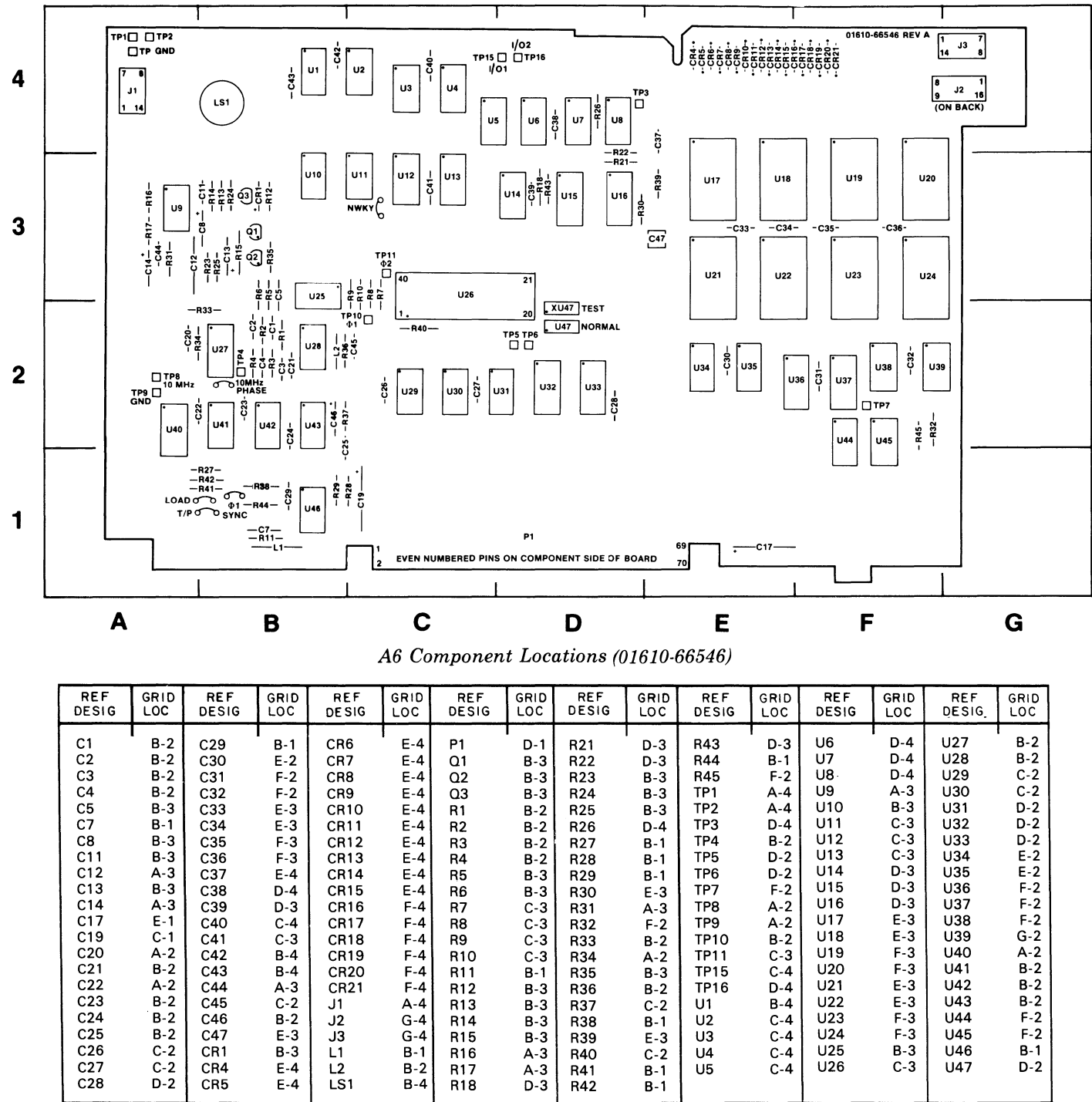
For read commands, NAND gates U10 and U11 are enabled through U44. Bits 0-6 contain the keyboard data. U15 selects either printer control, keyboard new key, I/O 1 or I/O 2 for bit 7.

During write commands, output flip-flops U12 and U13 are clocked to output data to the printer. Output flip-flops U6, 7 and 8 control the printer control bit, beeper, delta timer, probe driver mode, and acquisition clear line. The flip-flop to be clocked is selected by U16 as decoded from the address. During a power-up sequence, LPOP presets or clears all flip-flops to a known state.

The delta time interrupt is controlled by 20 Hz oscillator U9. A negative-going output is inverted and clocks the delta timer flip-flop U7A (resetting it), which causes LIRQ1 to go low. When TCTL is pulled low, the oscillator is reset and the U7A output is disabled from the LIRQ1 line. A write to 1005 presets U7A, thus removing any previous interrupts.

Beeper circuit U9B is controlled by an I/O output bit. 2.5 kHz oscillator U9B drives Q3 continually. Q1 and Q2 provide the required current to the speaker. In the quiescent state, C13 is discharged and no current flows. When the output bit is held low a minimum of 200 μs,

C13 charges through R25 and Q1. When the output bit is removed, C13 discharges through R23 and provides an exponential voltage to the base of Q2. Q2 is a Darlington transistor and provides a high input impedance enabling a more constant decay time of C13.



Block Diagram, 1610B Control and I/O Section

Figure 8-11. Service Sheet 6, MPU/IO Board A6 (Sheet 1 of 6)

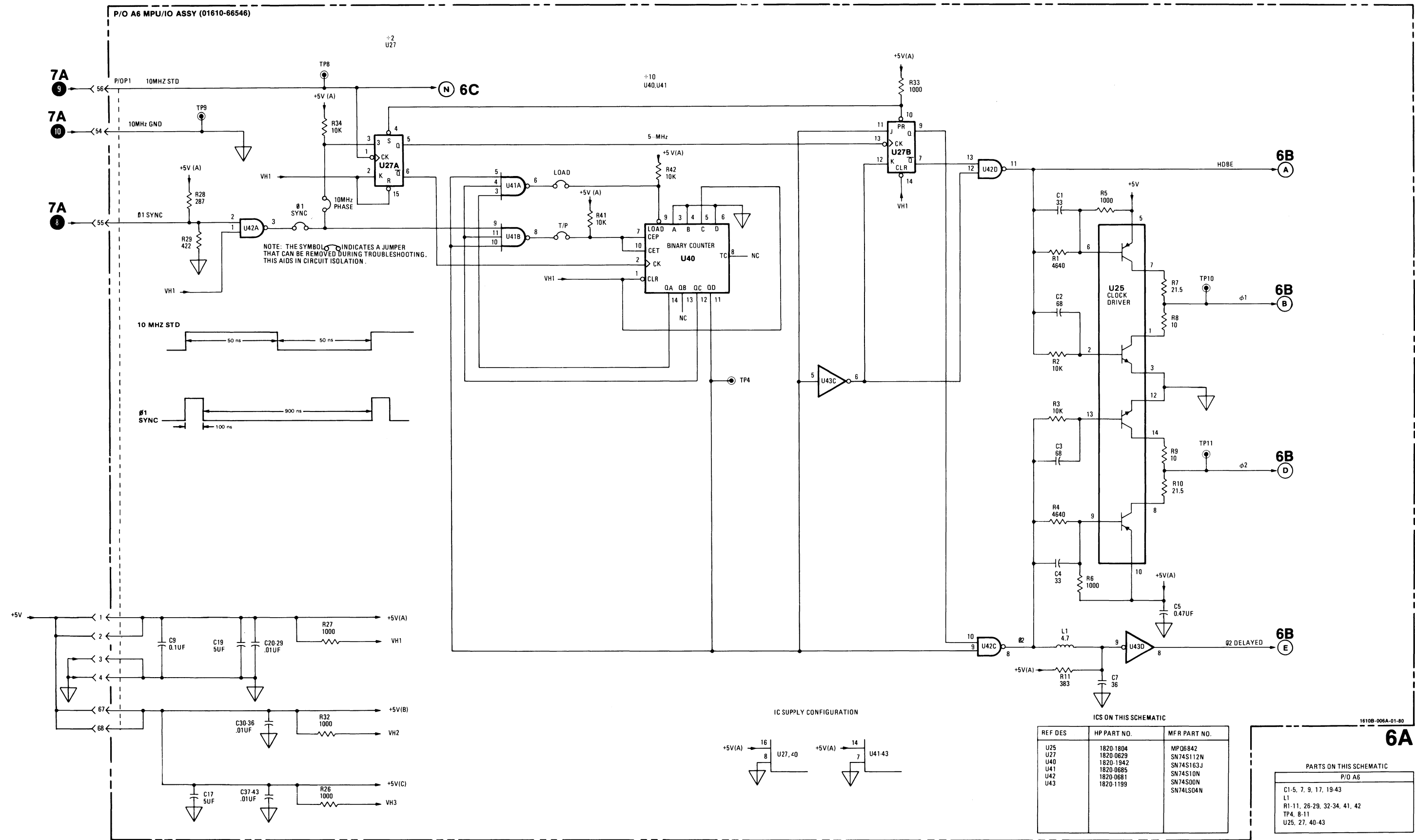
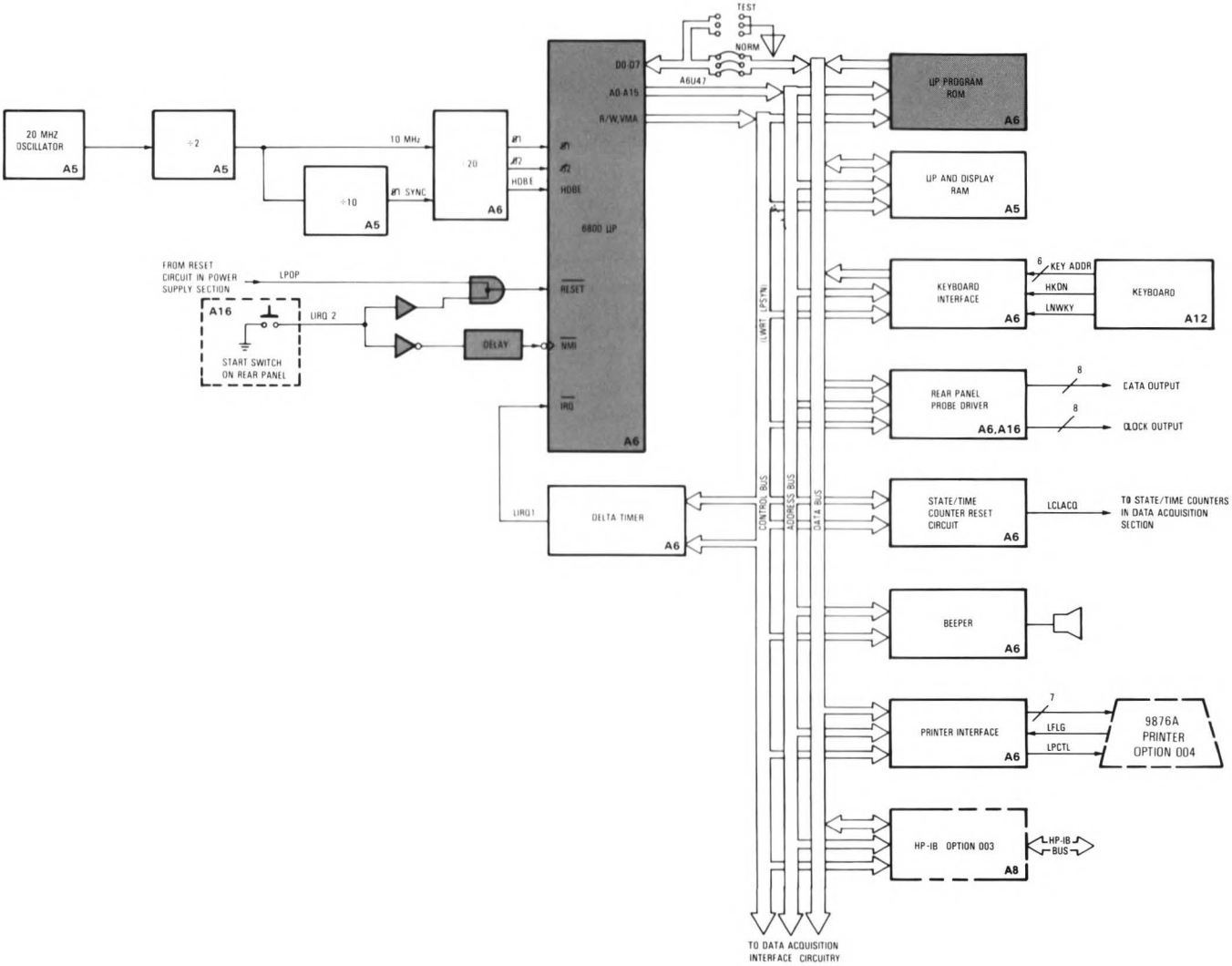
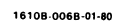


Figure 8-11.
Service Sheet 6, MPU/IO Board A6 (Sheet 2 of 6)
8-31



Block Diagram, 1610B Control and I/O Section

Figure 8-11. Service Sheet 6, MPU/IO Board A6 (Sheet 3 of 6)



6B

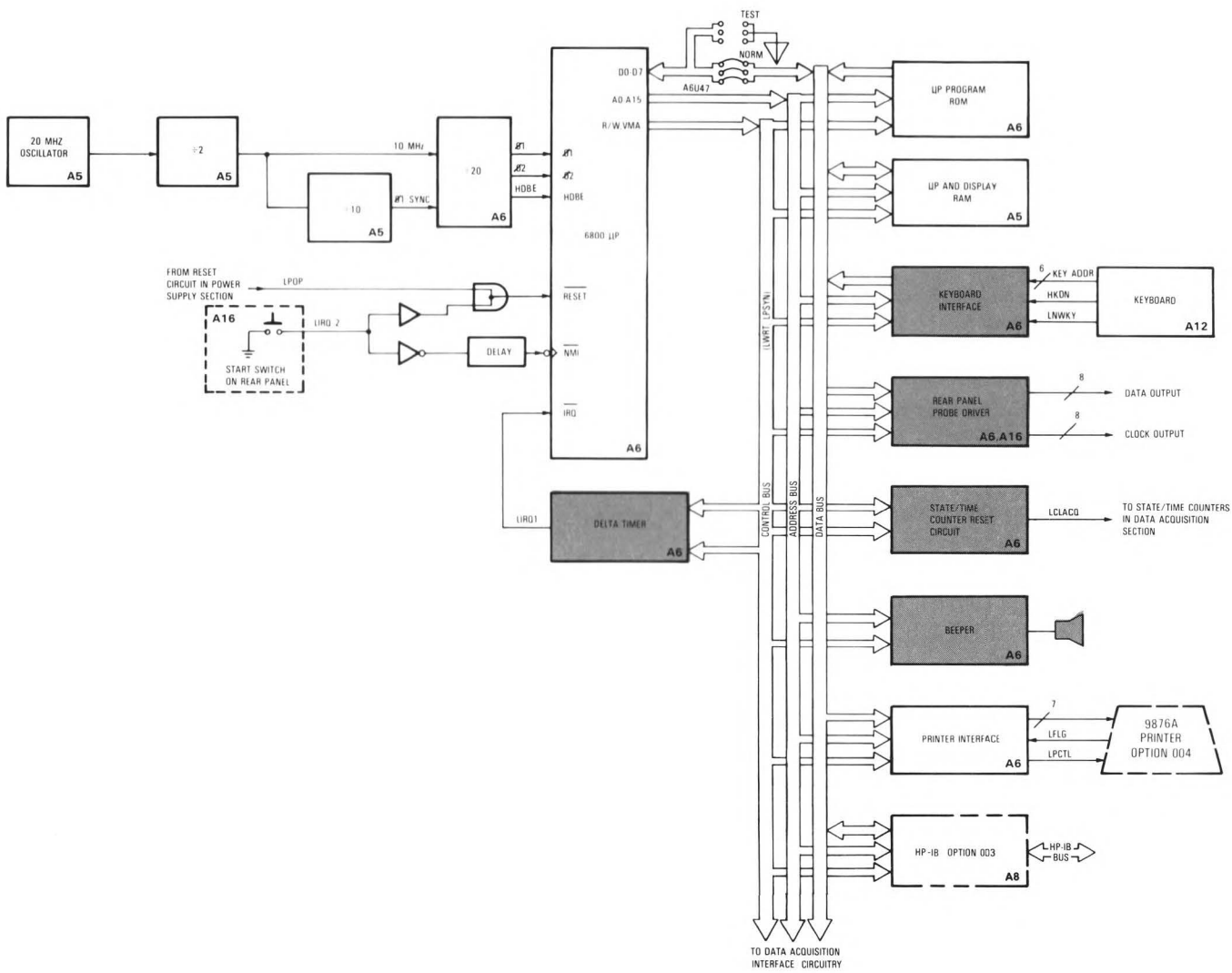
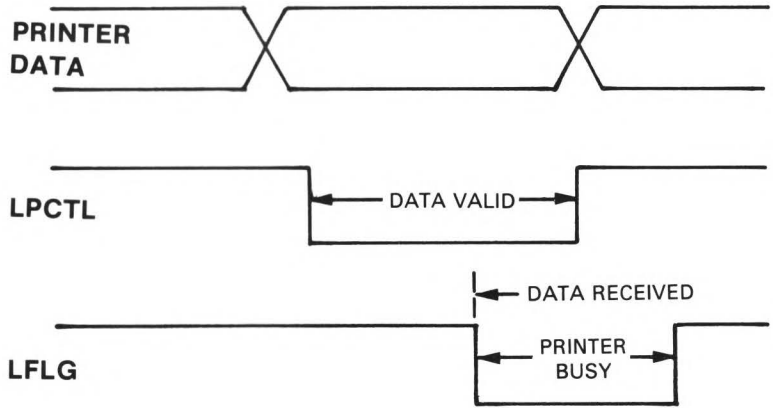
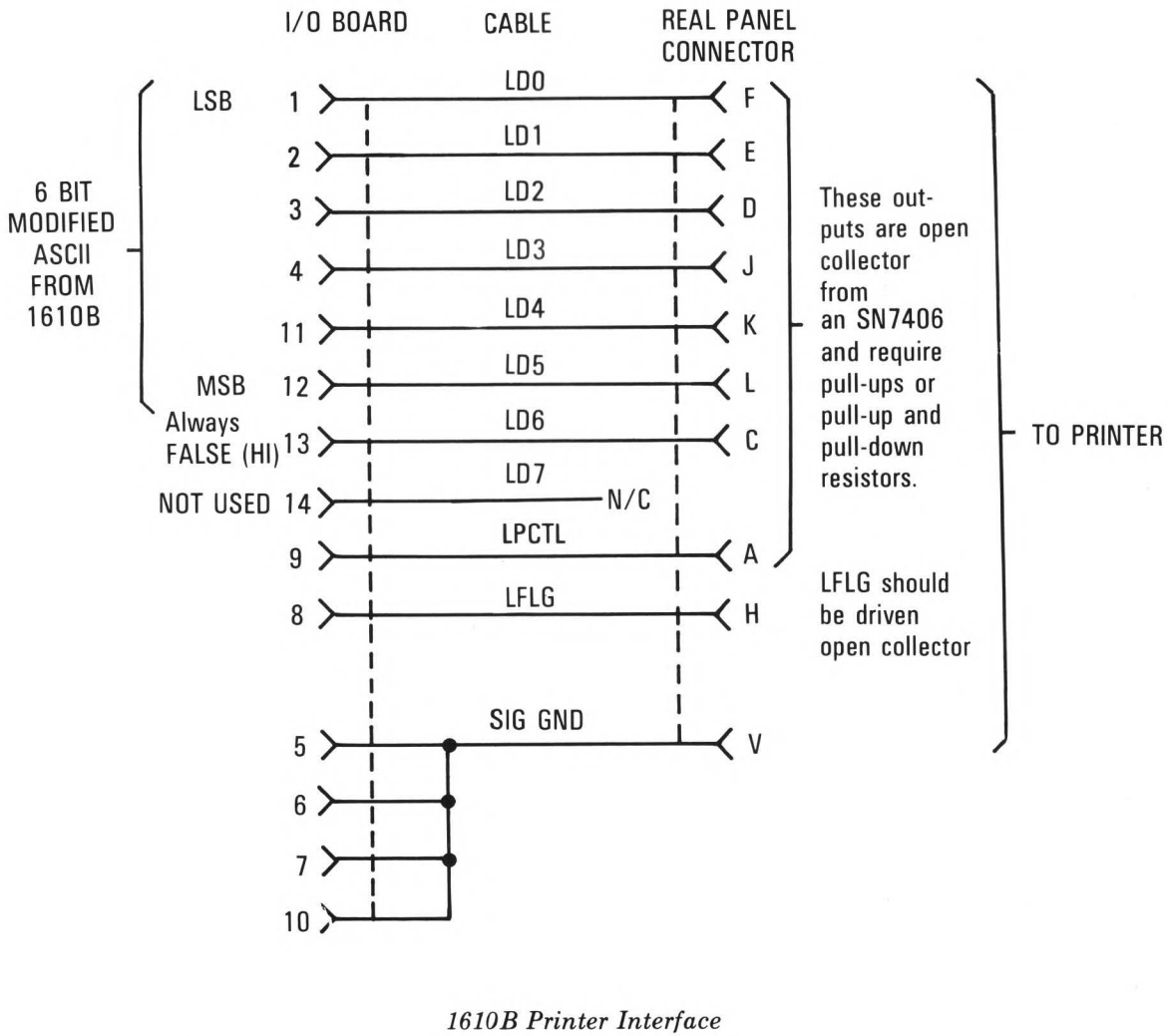


Figure 8-11. Service Sheet 6, MPU/IO Board A6 (Sheet 5 of 6)

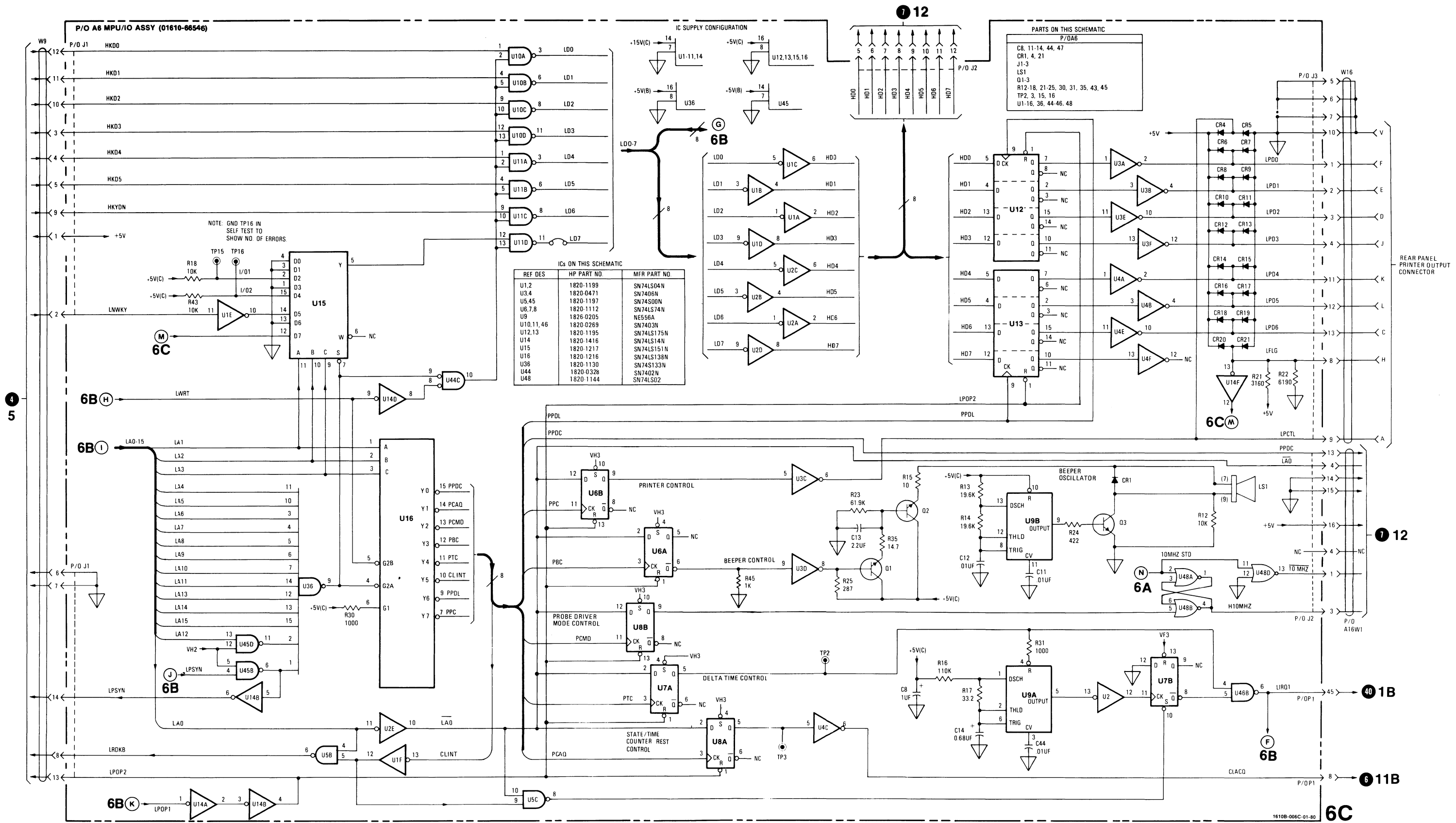
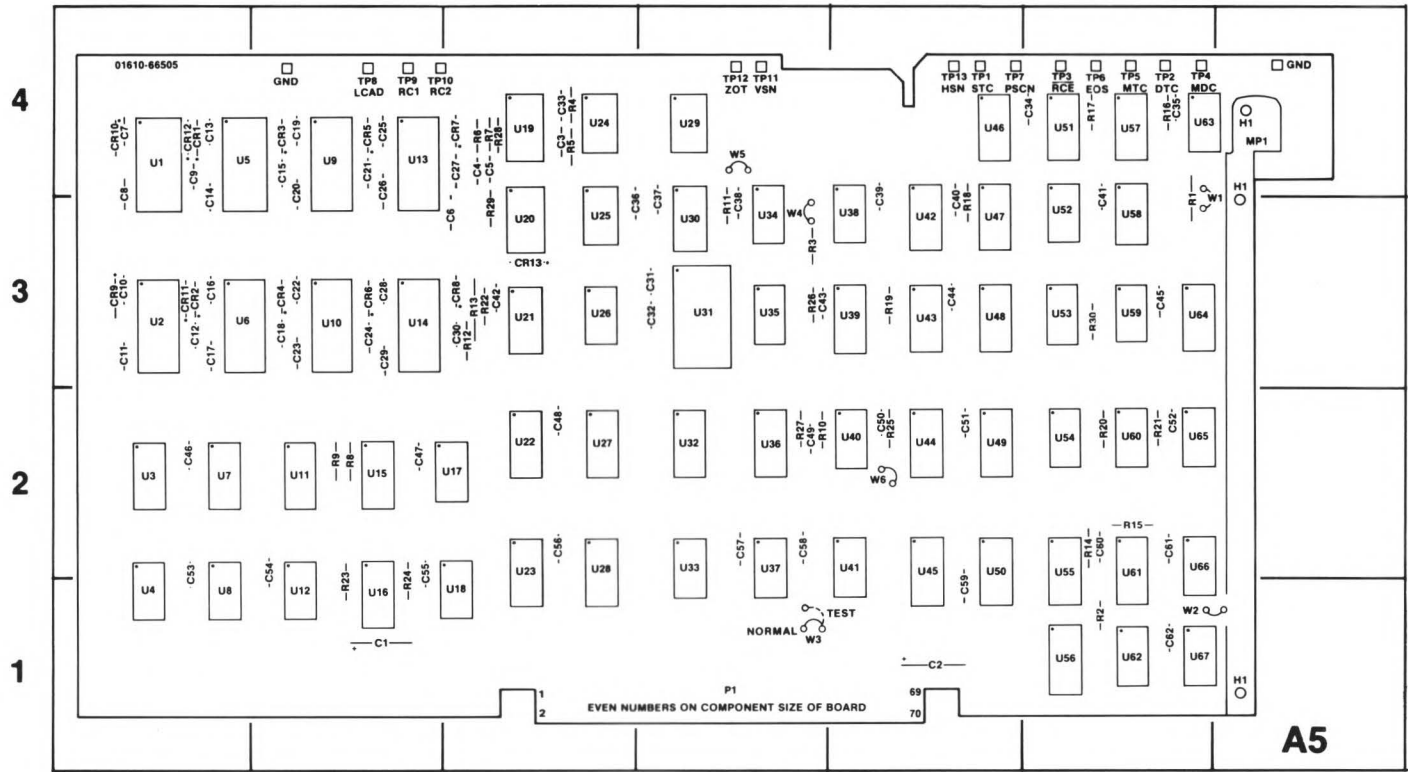
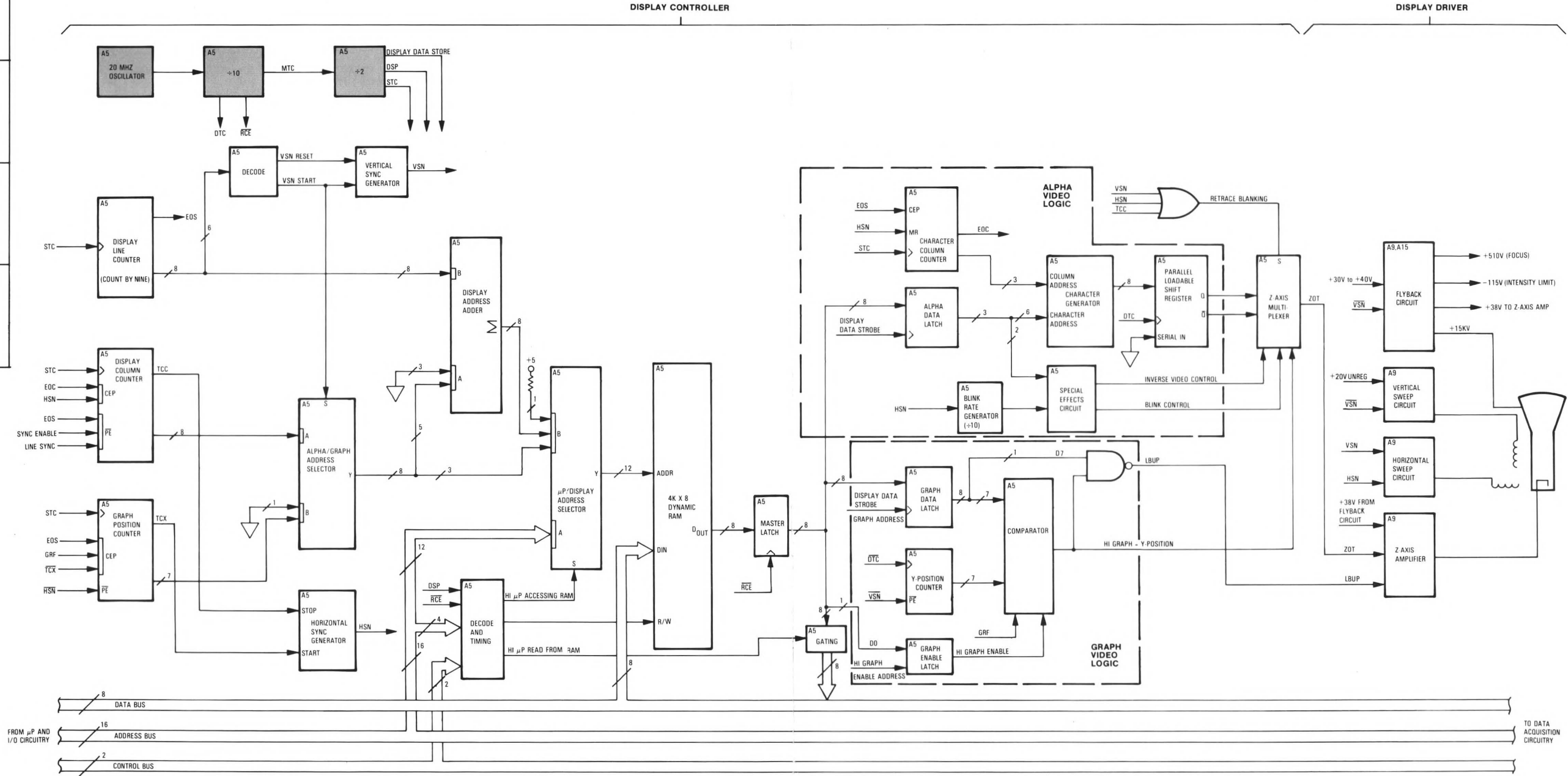


Figure 8-11.
Service Sheet 6, MPU/IO Board A6 (Sheet 6 of 6)
8-35



A5 Component Locations (01610-66505)

REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	B-1	C25	B-4	C49	D-2	CR11	A-3	R20	F-2	U1	A-4	U25	C-3	U49	E-2
C2	E-1	C26	B-4	C50	E-2	CR12	A-4	R21	F-2	U2	A-3	U26	C-3	U50	E-2
C3	C-4	C27	C-4	C51	E-2	CR13	C-3	R22	C-3	U3	A-2	U27	C-2	U51	F-4
C4	C-4	C28	B-3	C52	F-2	MP1	G-4	R23	B-2	U4	A-1	U28	C-2	U52	F-3
C5	C-4	C29	B-3	C53	A-2	P1	D-1	R24	B-2	U5	A-4	U29	D-4	U53	F-3
C6	C-3	C30	C-3	C54	B-2	R1	F-3	R25	E-2	U6	A-3	U30	D-3	U54	F-2
C7	A-4	C31	D-3	C55	B-2	R2	F-1	R26	D-3	U7	A-2	U31	D-3	U55	F-2
C8	A-4	C32	D-3	C56	C-2	R3	D-3	R27	D-2	U8	A-1	U32	D-3	U56	F-1
C9	A-4	C33	C-4	C57	D-2	R4	C-4	R28	C-4	U9	B-4	U33	D-2	U57	F-4
C10	A-3	C34	F-4	C58	D-2	R5	C-4	R29	C-3	U10	B-3	U34	D-3	U58	F-3
C11	A-3	C35	F-4	C59	E-1	R6	C-4	R30	F-3	U11	B-2	U35	D-3	U59	F-3
C12	A-3	C36	D-3	C60	F-2	R7	C-4	TP1	E-4	U12	B-1	U36	D-2	U60	F-2
C13	A-4	C37	D-3	C61	F-2	R8	B-2	TP2	F-4	U13	B-4	U37	D-2	U61	F-2
C14	A-4	C38	D-3	C62	C-3	R9	B-2	TP3	F-4	U14	B-3	U38	E-3	U62	F-1
C15	B-4	C39	E-4	CR1	A-4	R10	D-2	TP4	F-4	U15	B-2	U39	E-3	U63	F-4
C16	A-3	C40	E-4	CR2	A-3	R11	D-3	TP5	F-4	U16	B-1	U40	E-2	U64	F-3
C17	A-3	C41	F-4	CR3	B-4	R12	C-3	TP6	F-4	U17	C-2	U41	E-2	U65	F-2
C18	B-3	C42	C-3	CR4	B-3	R13	C-3	TP7	E-4	U18	C-1	U42	E-3	U66	F-2
C19	B-4	C43	D-3	CR5	B-4	R14	F-2	TP8	B-4	U19	C-4	U43	E-3	U67	F-1
C20	B-4	C44	E-3	CR6	B-3	R15	F-2	TP9	B-4	U20	C-3	U44	E-2	W1	F-3
C21	B-4	C45	F-3	CR7	C-4	R16	F-2	TP10	B-4	U21	C-3	U45	E-2	W2	F-1
C22	B-3	C46	A-2	CR8	C-3	R17	F-4	TP11	D-4	U22	C-2	U46	E-4	W3	D-1
C23	B-3	C47	B-2	CR9	A-3	R18	E-4	TP12	D-4	U23	C-2	U47	E-3	W4	D-3
C24	B-3	C48	C-2	CR10	A-4	R19	E-3	TP13	E-4	U24	C-4	U48	E-3	W5	D-4
														W6	E-2

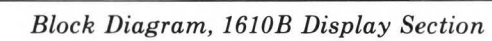


Block Diagram, 1610B Display Section

Figure 8-12. Service Sheet 7, Display Control Board A5 (Sheet 1 of 8)



8-37



8-38

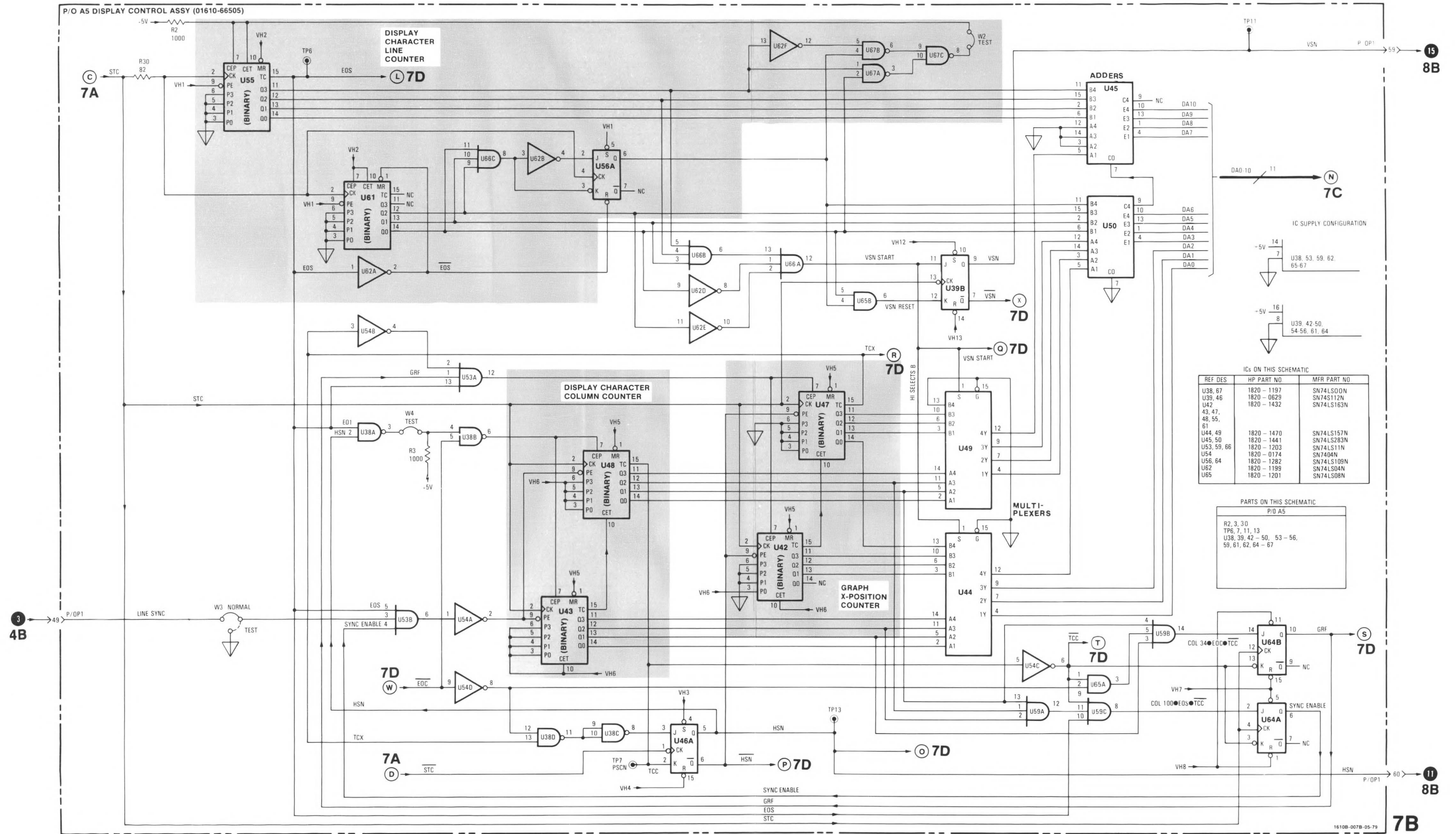


Figure 8-12.
Service Sheet 7, Display Control Board A5 (Sheet 4 of 8)
8-39

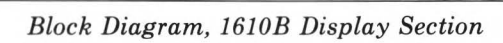
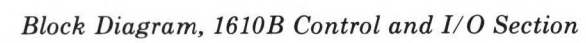


Figure 8-12. Service Sheet 7, Display Control Board A5 (Sheet 5 of 8)

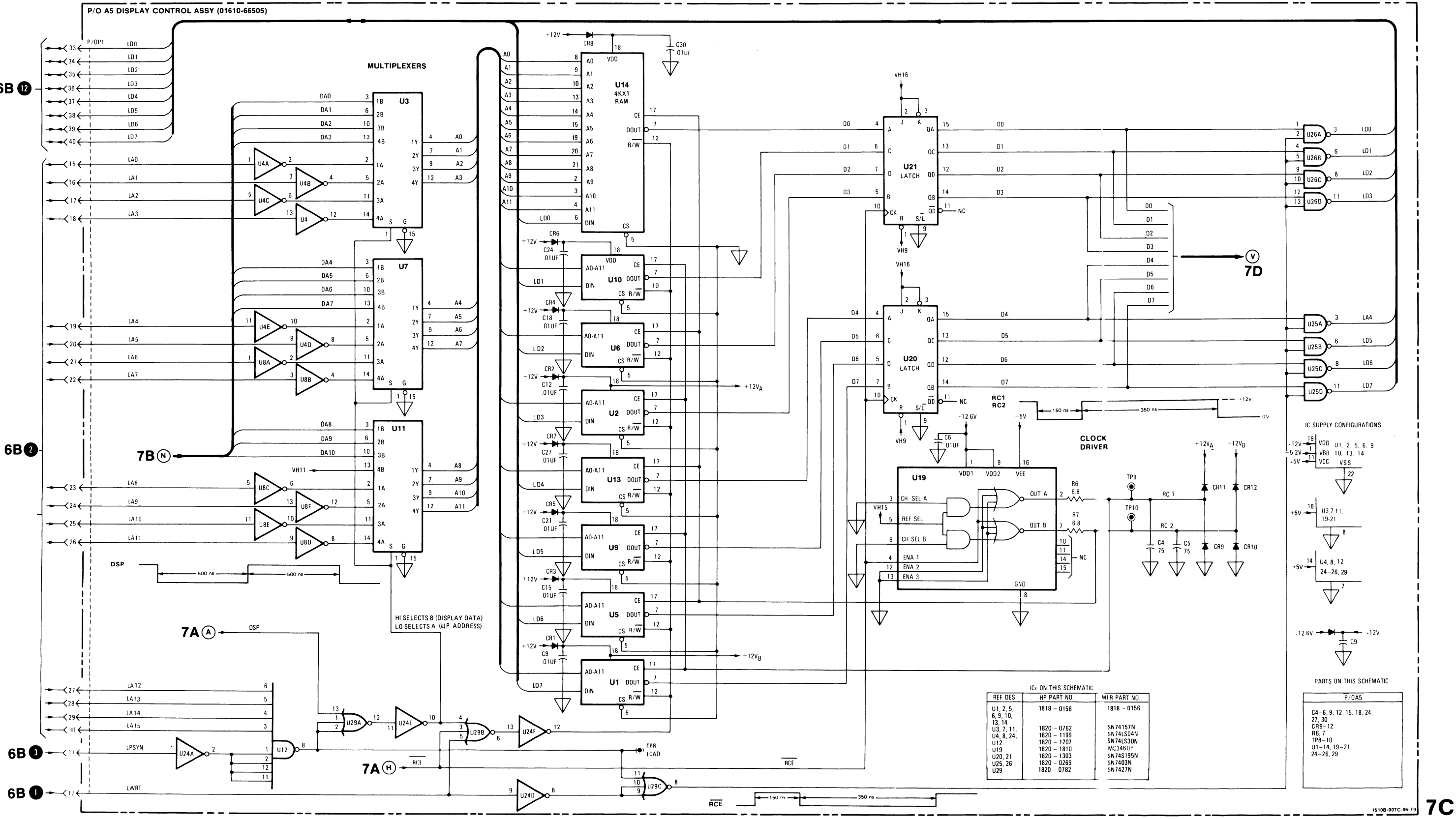
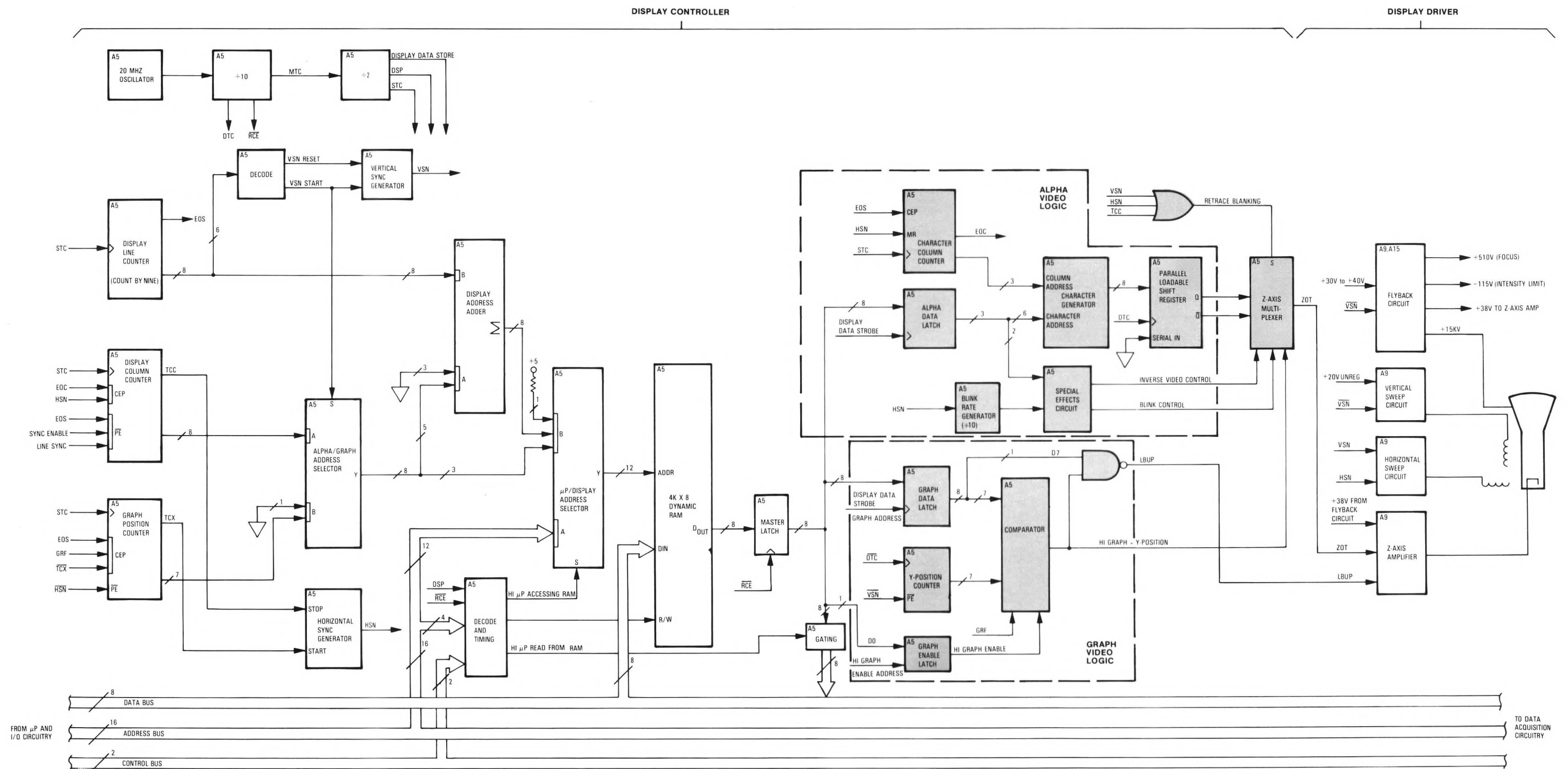


Figure 8-12.
Service Sheet 7, Display Control Board A5 (Sheet 6 of 8)
8-41



Block Diagram, 1610B Display Section

Figure 8-12. Service Sheet 7, Display Control Board A5 (Sheet 7 of 8)



Figure 8-12.

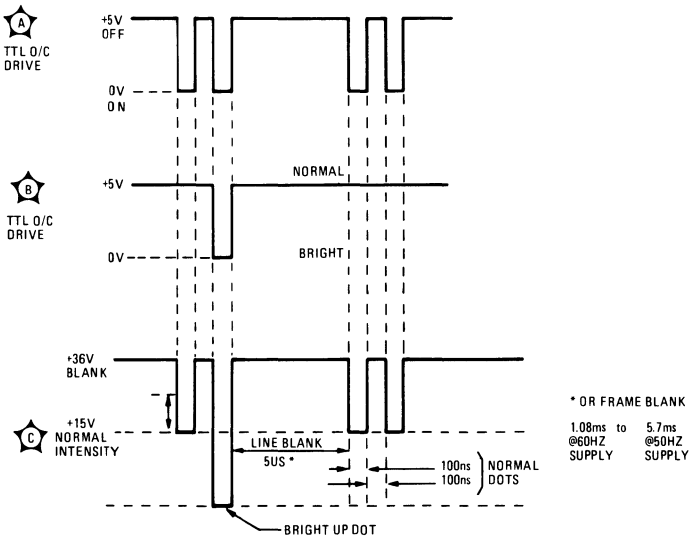
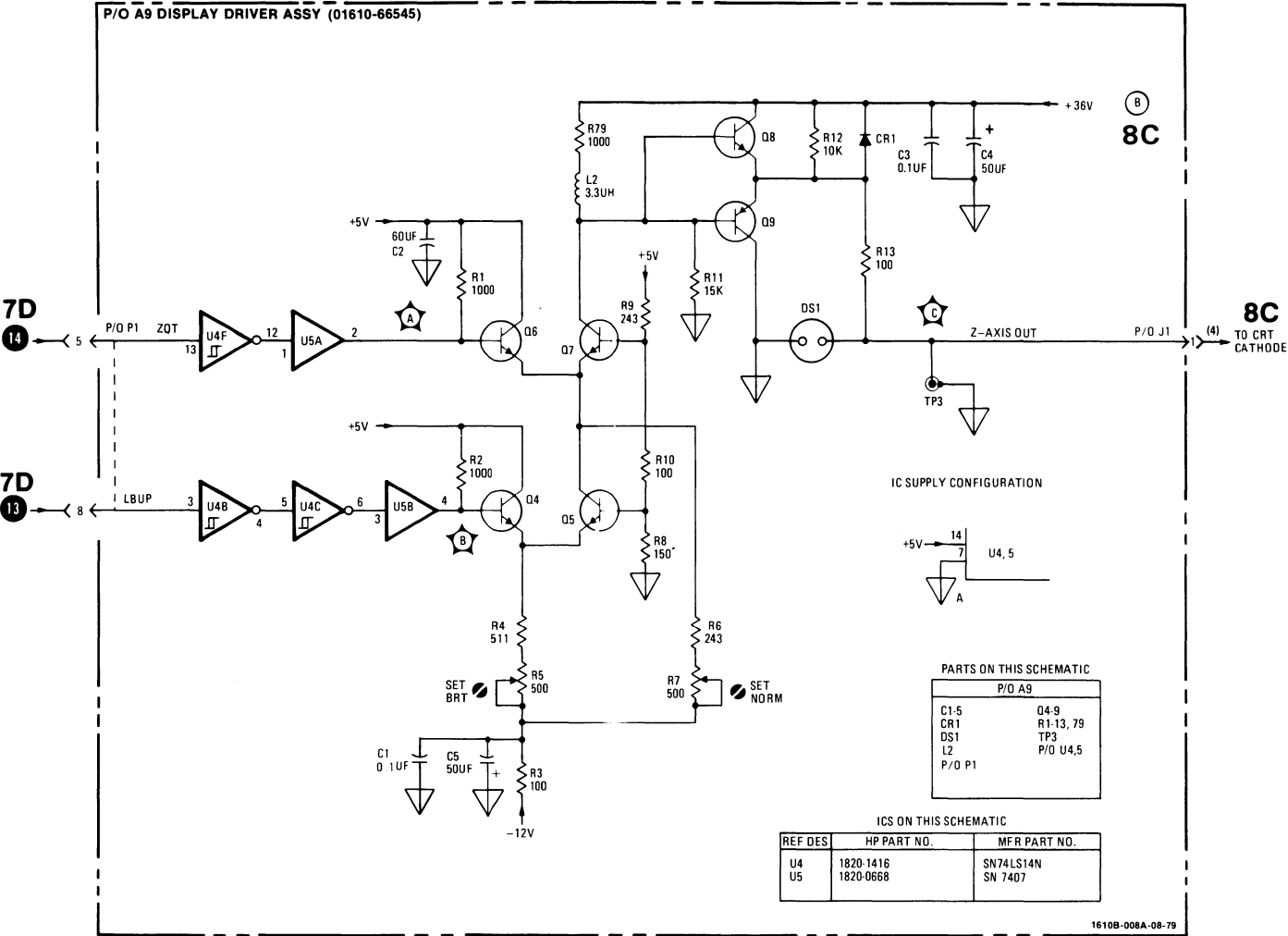


A9

REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	B-5	C26	C-5	CR3	C-5	MP4	E-6	R10	B-5	R36	F-3	R61	D-2	TP1	C-4		
C2	B-5	C27	C-3	CR4	C-5	Q1	E-5	R11	B-4	R37	F-3	R62	C-2	TP2	C-5		
C3	B-4	C28	C-2	CR5	D-5	Q2	F-5	R12	B-3	R38	B-2	R63	C-2	TP3	C-3		
C4	B-4	C29	C-3	CR6	B-3	Q3	F-2	R13	B-3	R39	B-2	R64	D-2	TP4	B-2		
C5	C-5	C30	C-3	CR7	A-2	Q4	A-5	R14	F-2	R40	B-3	R65	C-5	TP5	C-3		
C6	G-2	C31	D-1	CR8	G-4	Q5	B-5	R15	F-2	R41	B-3	R66	C-5	U1	F-2		
C7	E-2	C32	C-4	CR9	C-5	Q6	B-5	R16	F-3	R42	A-6	R67	D-5	U2	C-4		
C8	F-2	C33	D-5	CR10	D-3	Q7	B-5	R17	G-2	R43	B-3	R68	B-4	U3	D-3		
C9	G-2	C34	D-5	DS1	C-5	O8	A-8	R18	F-3	R44	B-3	R69	C-5	U4	B-3		
C10	G-3	C35	D-5	E1	G-3	O9	B-4	R19	F-3	R45	B-3	R70	C-5	U5	B-3		
C11	D-4	C36	D-5	H1	E-5	O10	B-2	R20	F-2	R46	C-2	R71	C-6	U6	F-4		
C12	D-4	C37	D-5	H2	E-5	Q11	A-2	R21	F-3	R47	D-2	R72	C-6	U7	B-3		
C13	G-4	C38	E-2	H3	G-3	Q12	B-2	R22	F-3	R48	D-2	R73	C-6	VR1	D-3		
C14	F-4	C39	E-2	H4	G-3	Q13	C-3	R23	F-3	R49	D-2	R74	C-5	VR2	G-3		
C15	F-3	C40	E-4	H5	E-5	Q14	G-3	R24	D-4	R50	B-5	R75	C-5	VR3	G-4		
C16	F-4	C42	C-2	J1	D-4	Q15	G-3	R25	C-3	R51	C-2	R76	C-5	VR4	G-4		
C17	F-3	C43	D-2	L1	G-6	R1	B-5	R26	F-4	R52	C-6	R77	C-2	VR5	D-3		
C18	F-3	C44	E-2	L2	B-4	R2	B-6	R27	F-6	R53	C-3	R78	D-2	VR6	D-3		
C19	E-3	C45	C-3	L3	F-1	R3	B-6	R28	F-4	R54	C-3	R79	A-4	VR7	D-3		
C20	A-3	C46	B-3	L4	F-5	R4	B-6	R29	F-4	R55	C-2	R80	F-6	VR8	E-3		
C21	A-3	C47	F-2	L5	E-5	R5	B-6	R30	F-4	R56	D-2	R81	C-4	VR9	D-3		
C22	B-2	C48	D-2	L6	C-1	R6	B-6	R31	F-3	R57	D-1	R82	C-3	VR10	B-4		
C23	A-1	C49	E-2	MP1	F-5	R7	B-6	R32	F-4	R58	D-1	R83	C-3	VR11	D-3		
C24	B-1	CR1	B-3	MP2	G-5	R8	B-5	R33	F-3	R59	D-1	R85	E-2	VR12	D-3		
C25	D-3	CR2	D-3	MP3	G-3	R9		R34	F-3	R60	C-2	T1	D-4				
								R35									

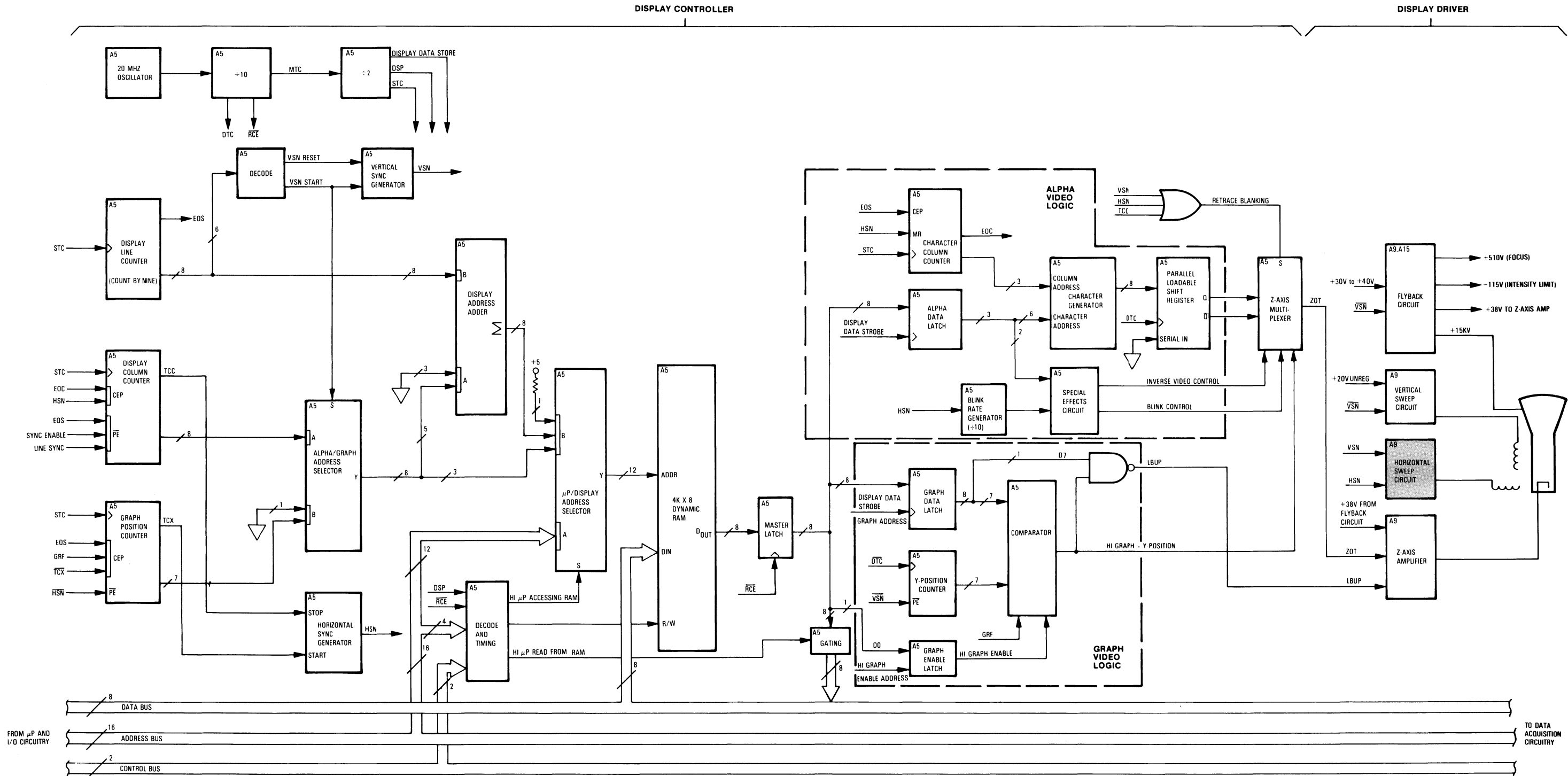


Figure 8-13. Service Sheet 8, Display Driver Board A9 (Sheet 1 of 6)



8A

Figure 8-13.
Service Sheet 8, Display Driver Board A9 (Sheet 2 of 6)
8-45



Block Diagram, 1610B Display Section

Figure 8-13. Service Sheet 8, Display Driver Board A9 (Sheet 3 of 6)

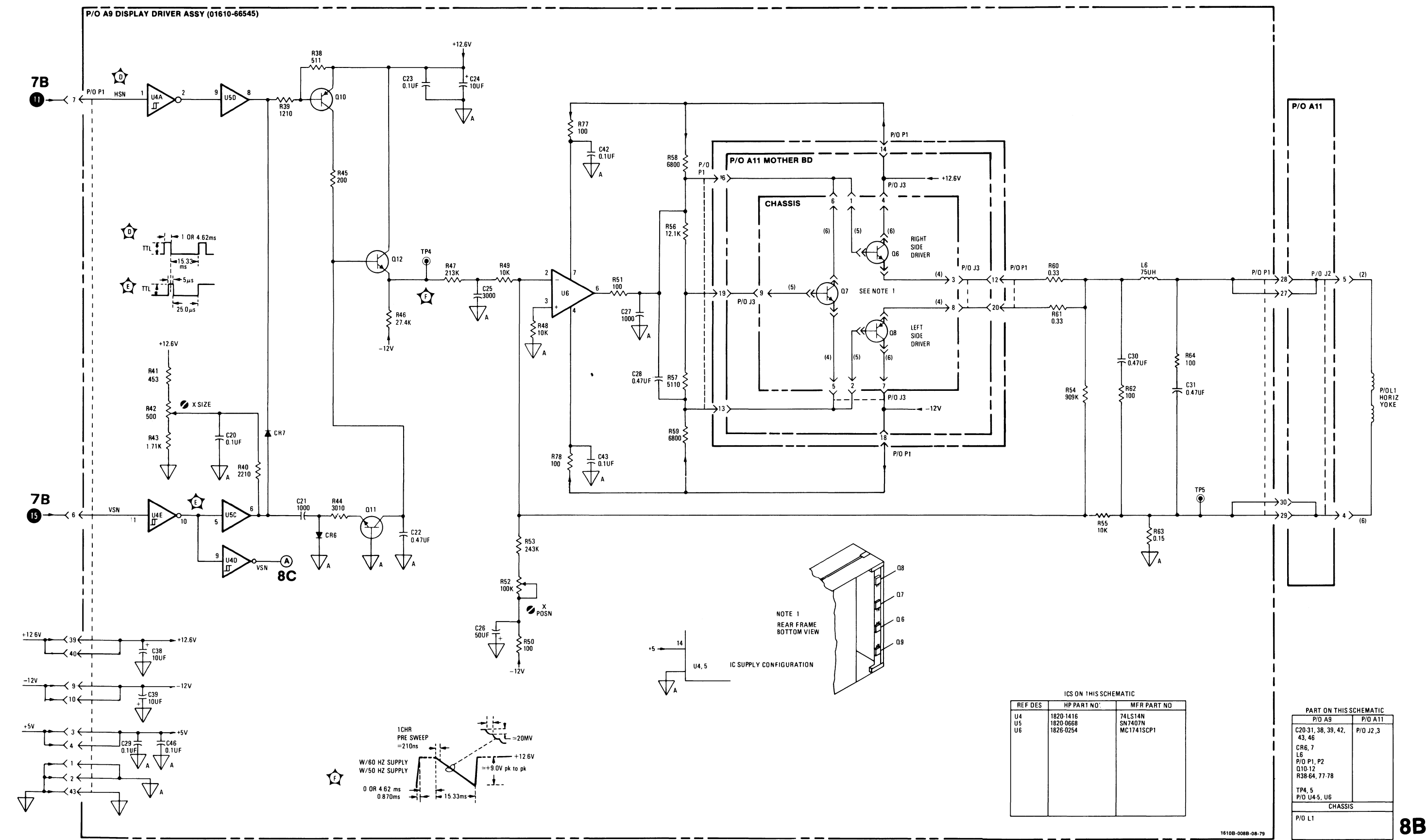
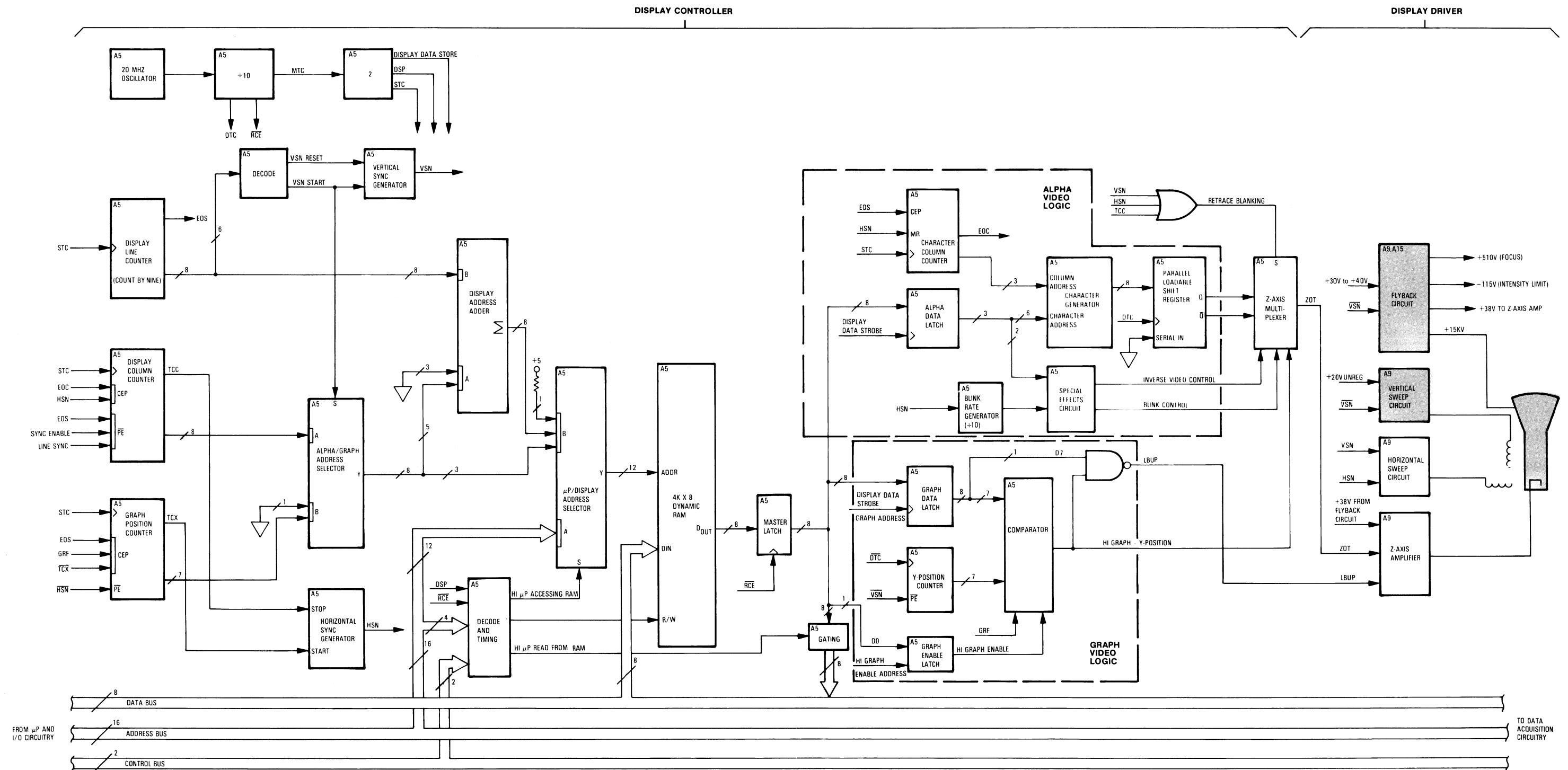


Figure 8-13.
Service Sheet 8, Display Driver Board A9 (Sheet 4 of 6)
8-47



Block Diagram, 1610B Display Section

Figure 8-13. Service Sheet 8, Display Driver Board A9 (Sheet 5 of 6)

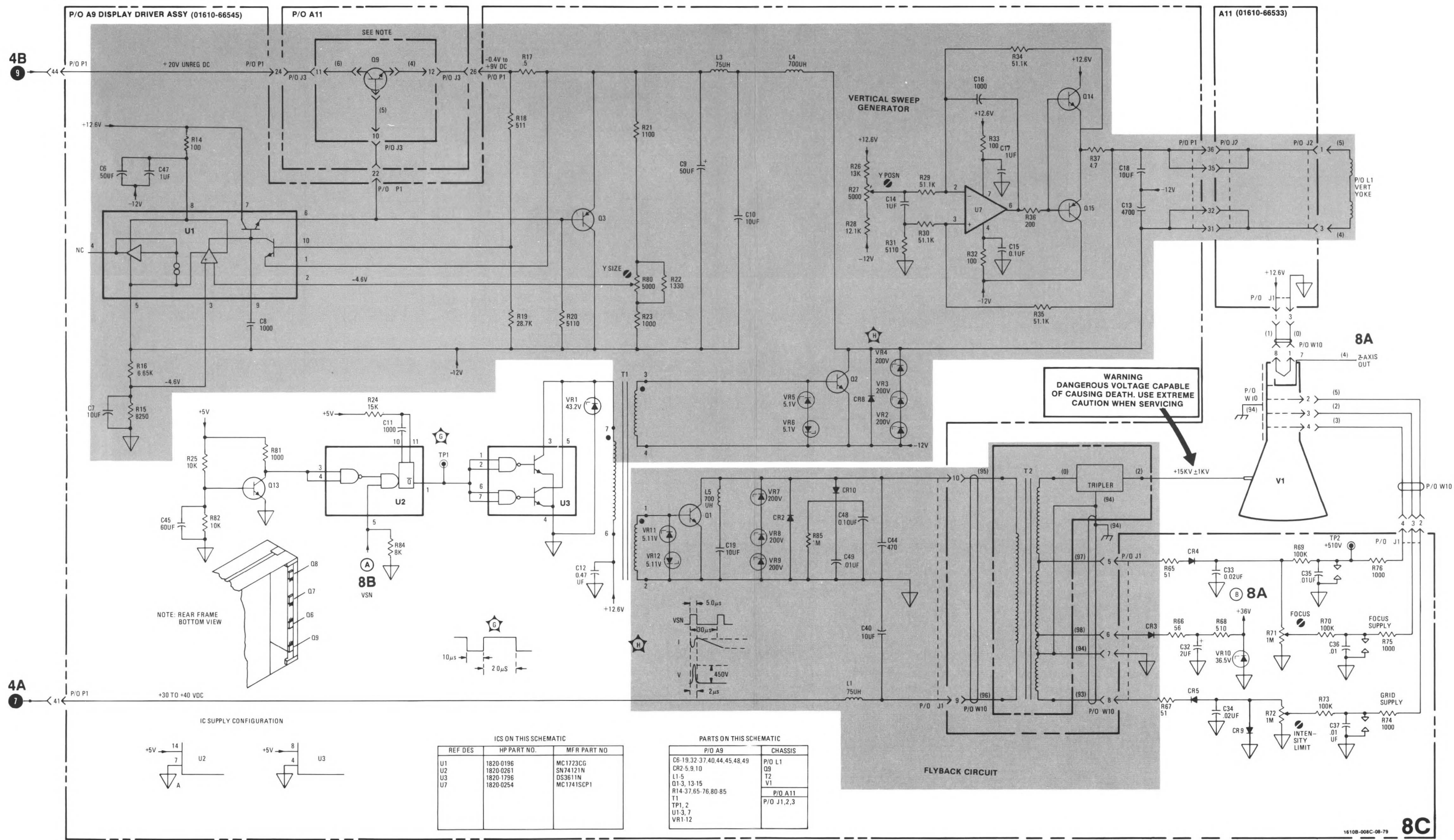
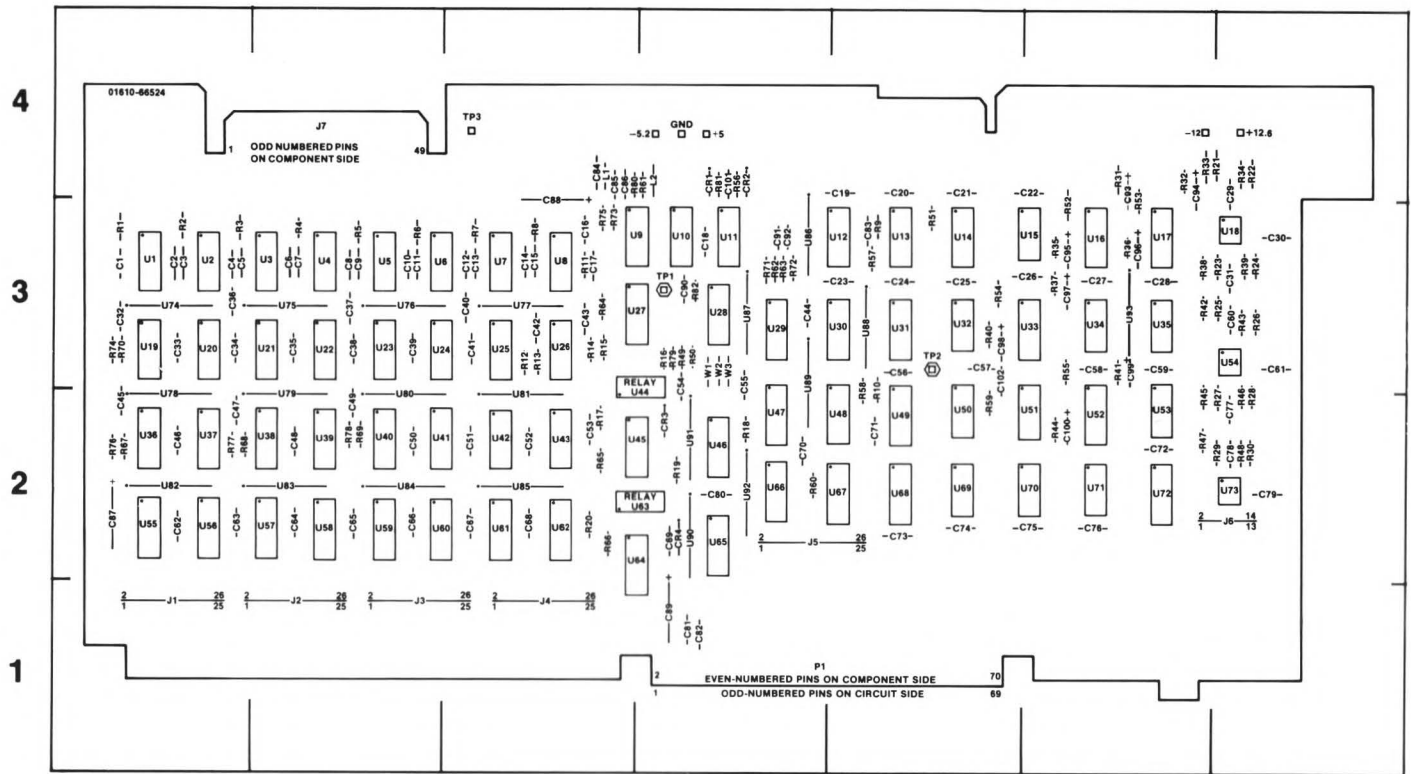
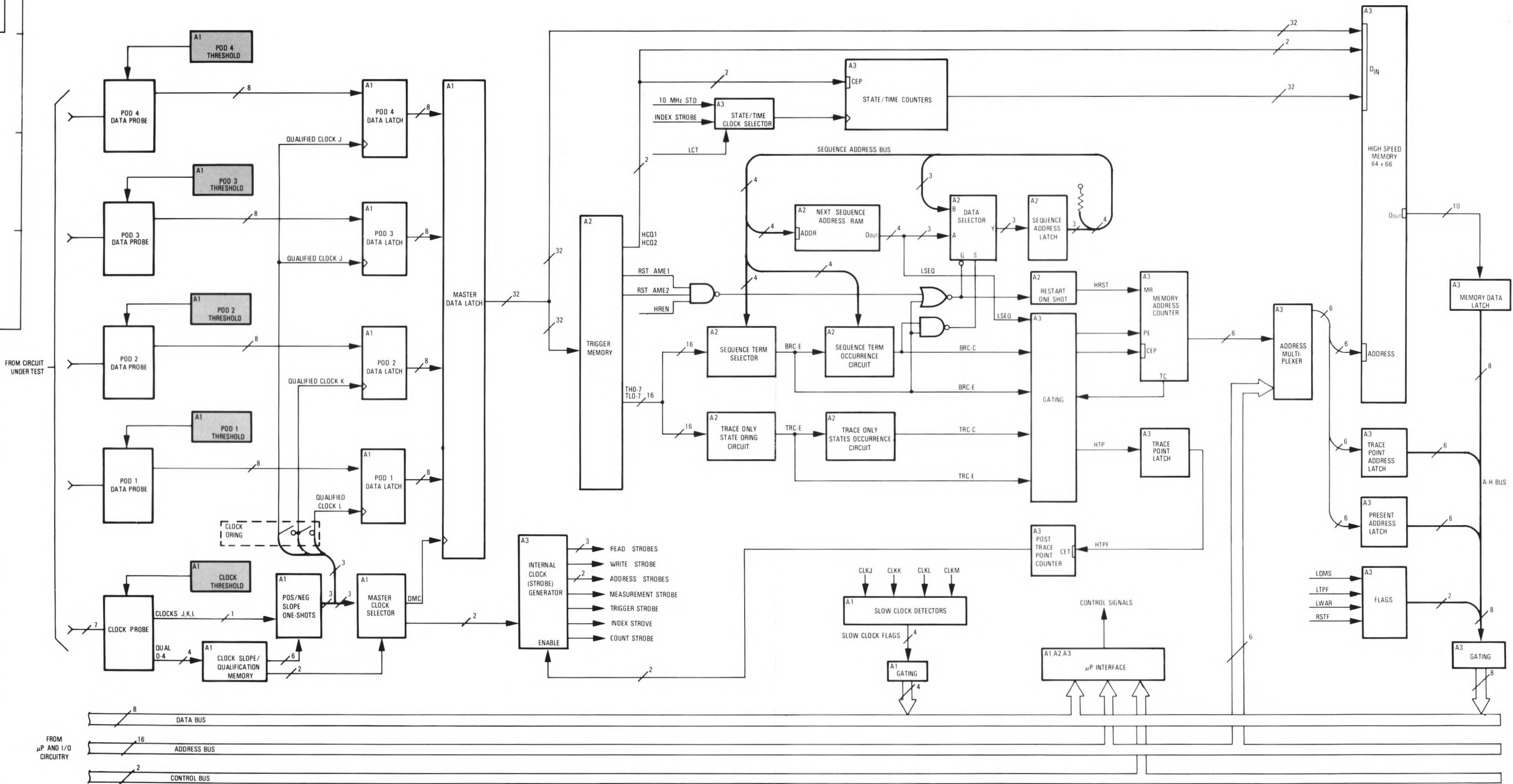


Figure 8-13.
Service Sheet 8, Display Driver Board A9 (Sheet 6 of 6)
8-49



A1 Component Locations (01610-66524)

REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	A-3	C38	B-3	C75	F-2	J6	G-1	R34	G-4	R71	D-3	U23	B-3	U60	C-2
C2	A-3	C39	B-3	C76	F-2	J7	G-1	R35	D-3	R72	D-3	U24	C-3	U61	C-2
C3	A-3	C40	C-3	C77	G-2	L1	C-4	R36	F-3	R73	C-3	U25	C-3	U62	C-2
C4	A-3	C41	C-3	C78	G-2	L2	D-4	R37	F-3	R74	A-3	U26	C-3	U63	D-2
C5	A-3	C42	C-3	C79	G-2	R1	A-3	R38	G-3	R75	C-3	U27	D-3	U64	D-2
C6	B-3	C43	C-3	C80	D-2	R2	A-3	R39	G-3	R76	A-2	U28	D-3	U65	D-2
C7	B-3	C44	D-3	C81	D-1	R3	A-3	R40	E-3	R77	A-2	U29	D-3	U66	D-2
C8	B-3	C45	A-2	C82	D-1	R4	B-3	R41	F-3	R78	B-2	U30	E-3	U67	E-2
C9	B-3	C46	A-2	C83	E-3	R5	B-3	R42	G-3	R79	D-3	U31	E-3	U68	E-2
C10	B-3	C47	A-2	C84	C-4	R6	B-3	R43	G-3	R80	D-4	U32	E-3	U69	E-2
C11	B-3	C48	B-2	C85	C-4	R7	C-3	R44	F-2	R81	D-4	U33	F-3	U70	F-2
C12	C-3	C49	B-2	C86	C-4	R8	C-3	R45	G-2	R82	D-3	U34	F-3	U71	F-2
C13	C-3	C50	B-2	C87	A-2	R9	E-3	R46	G-2	TP1	D-3	U35	F-3	U72	F-2
C14	C-3	C51	C-2	C88	C-3	R10	E-2	R47	G-2	TP2	E-3	U36	A-2	U73	G-2
C15	C-3	C52	C-2	C89	D-1	R11	C-3	R48	G-2	TP3	C-4	U37	A-2	U74	A-3
C16	C-3	C53	C-2	C90	D-3	R12	C-3	R49	D-3	U1	A-3	U38	B-2	U75	B-3
C17	C-3	C54	D-3	C91	C-3	R13	C-3	R50	D-3	U2	A-3	U39	B-2	U76	B-3
C18	D-3	C55	D-3	C92	C-3	R14	C-3	R51	E-3	U3	B-3	U40	B-2	U77	C-3
C19	E-4	C56	E-3	C93	F-4	R15	C-3	R52	F-3	U4	B-3	U41	C-2	U78	A-2
C20	E-4	C57	E-3	C94	F-4	R16	D-3	R53	F-3	U5	B-3	U42	C-2	U79	B-2
C21	E-4	C58	F-3	C95	F-3	R17	C-2	R54	E-3	U6	C-3	U43	C-2	U80	B-2
C22	F-4	C59	F-3	C96	F-3	R18	D-2	R55	F-3	U7	C-3	U44	D-2	U81	C-2
C23	E-3	C60	G-3	C97	F-3	R19	D-2	R56	D-4	U8	C-3	U45	D-2	U82	A-2
C24	E-3	C61	G-3	C98	E-3	R20	C-2	R57	E-3	U9	D-3	U46	D-2	U83	B-2
C25	E-3	C62	A-2	C99	F-3	R21	G-2	R58	E-2	U10	D-3	U47	D-2	U84	B-2
C26	F-3	C63	A-2	C100	F-2	R22	G-4	R59	E-2	U11	D-3	U48	E-2	U85	C-2
C27	F-3	C64	B-2	C101	D-4	R23	G-3	R60	D-2	U12	E-3	U49	E-2	U86	D-3
C28	F-3	C65	B-2	C102	E-3	R24	G-3	R61	D-4	U13	E-3	U50	E-2	U87	D-3
C29	G-4	C66	B-2	CR1	D-4	R25	G-3	R62	D-3	U14	E-3	U51	F-2	U88	E-3
C30	G-3	C67	C-2	CR2	D-4	R26	G-3	R63	D-3	U15	F-3	U52	F-2	U89	D-3
C31	G-3	C68	C-2	CR3	D-2	R27	G-2	R64	C-3	U16	F-3	U53	F-2	U90	D-2
C32	A-3	C69	D-2	CR4	D-2	R28	G-2	R65	C-2	U17	F-3	U54	G-3	U91	D-2
C33	A-3	C70	D-2	J1	A-1	R29	G-2	R66	C-2	U18	G-3	U55	A-2	U92	D-2
C34	A-3	C71	E-2	J2	B-1	R30	G-2	R67	A-2	U19	A-3	U56	A-2	U93	F-3
C35	B-3	C72	F-2	J3	B-1	R31	F-4	R68	B-2	U20	A-3	U57	B-2	W1	D-3
C36	A-3	C73	E-2	J4	C-1	R32	F-4	R69	B-2	U21	B-3	U58	B-2	W2	D-3
C37	B-3	C74	E-2	J5	D-1	R33	G-4	R70	A-3	U22	B-3	U59	B-2	W3	D-3



Block Diagram, 1610B Data Acquisition Section

Figure 8-14. Service Sheet 9, State Recognition Board A1 (Sheet 1 of 6)

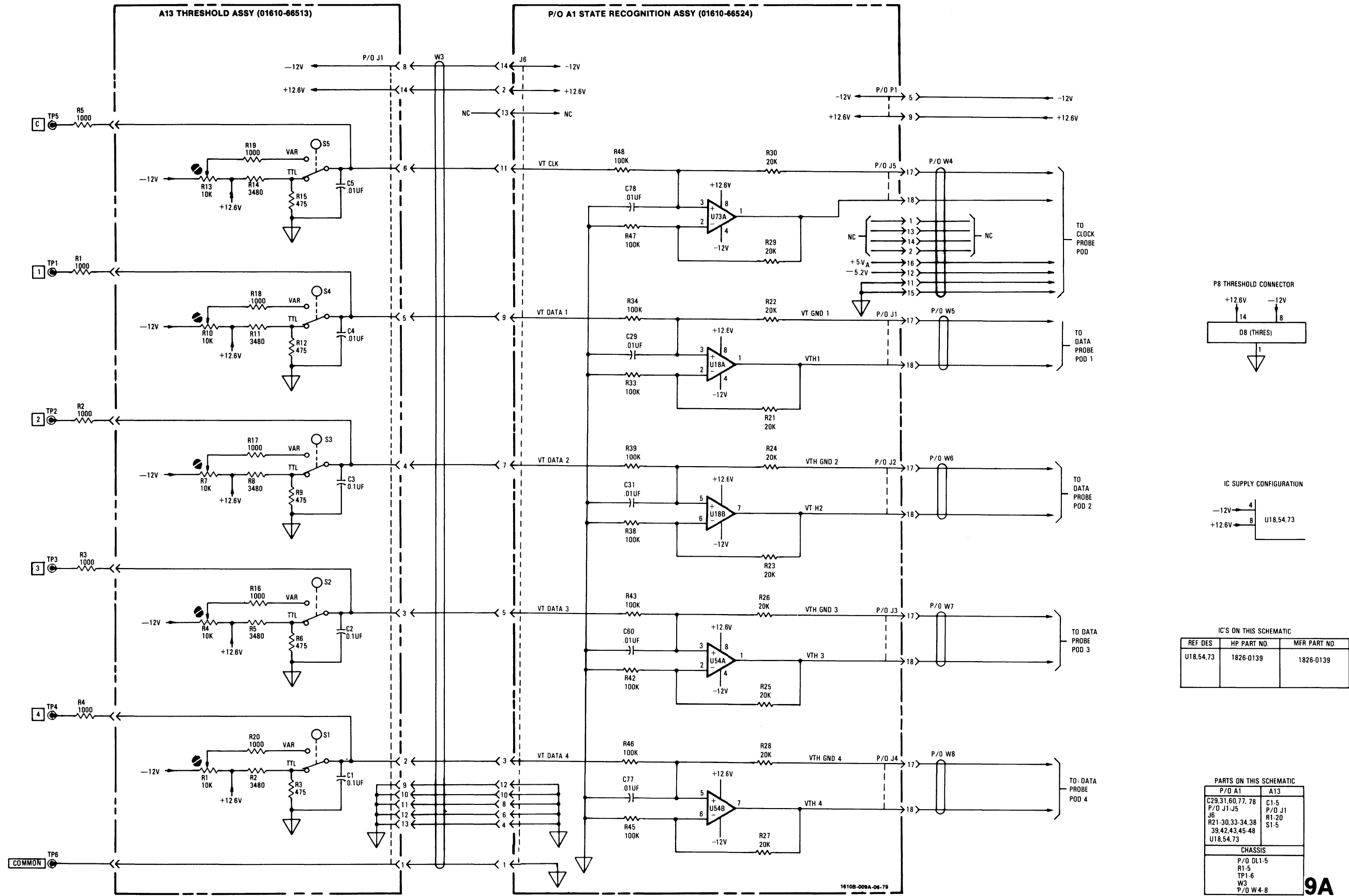
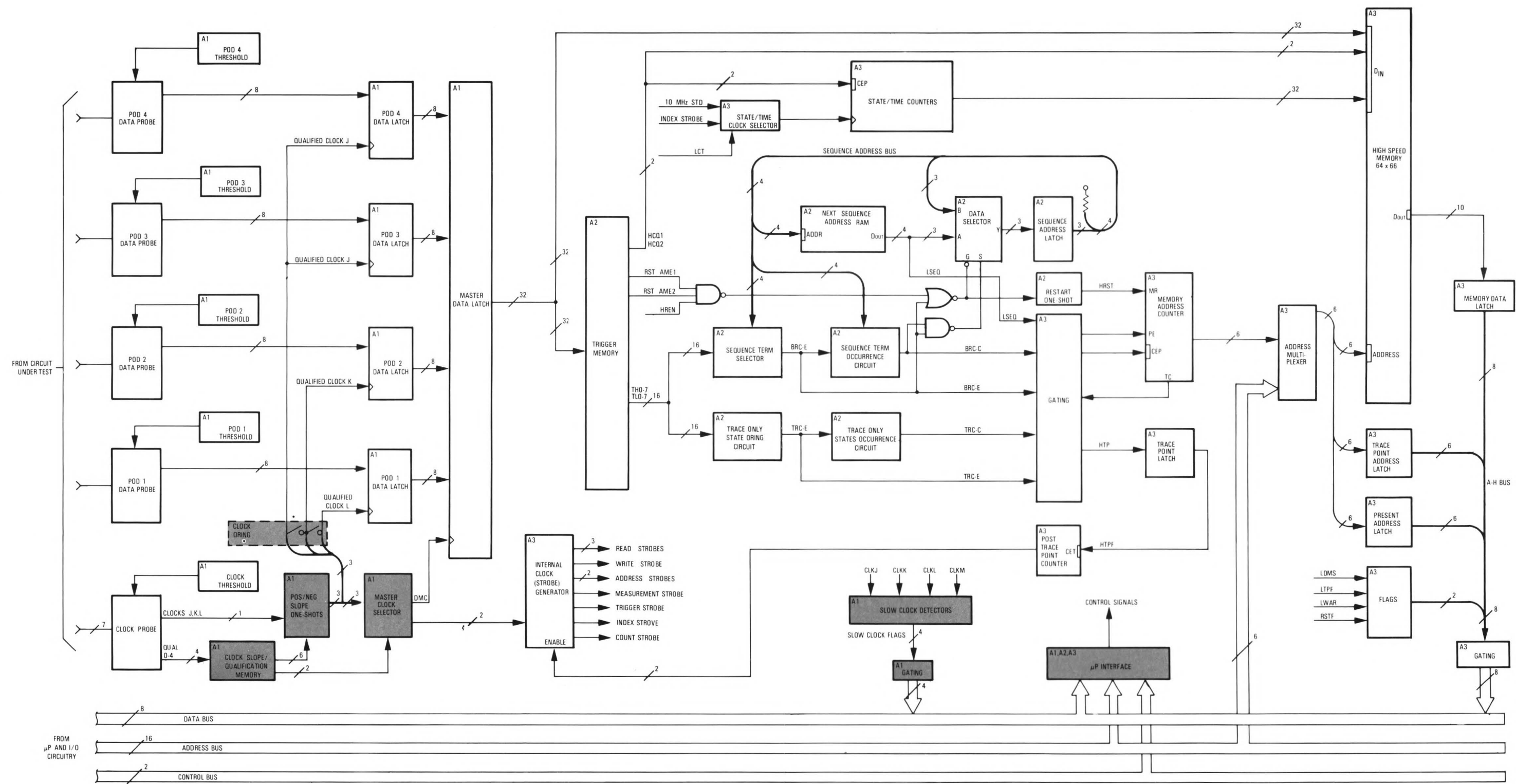
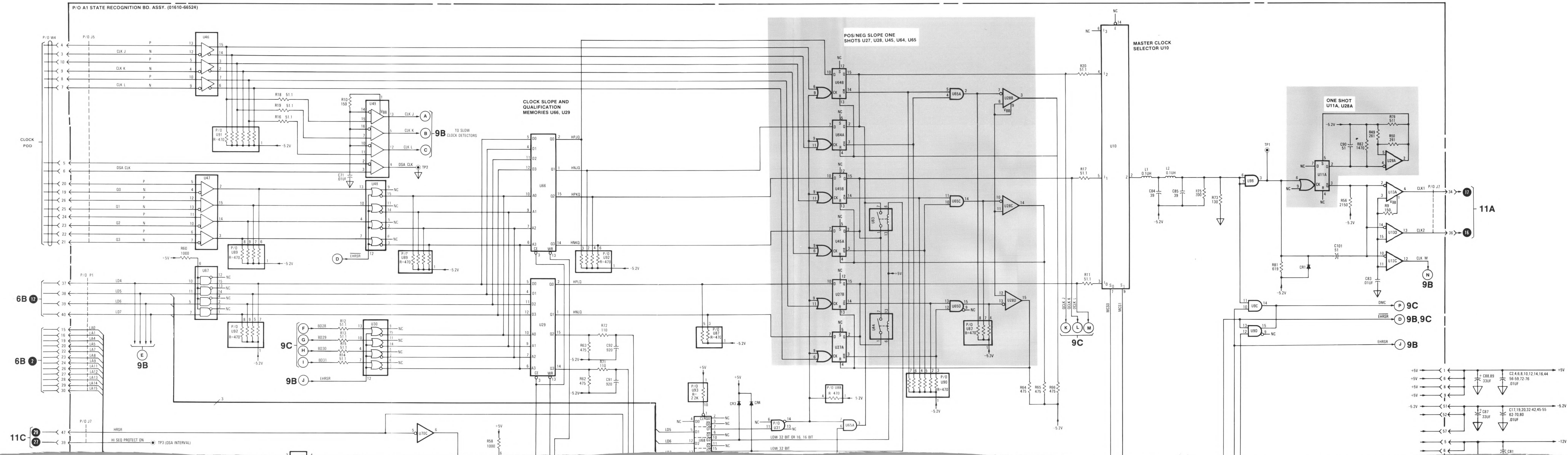


Figure 8-14.
Service Sheet 9, State Recognition Board A1 (Sheet 2 of 6)
8-51



Block Diagram, 1610B Data Acquisition Section

Figure 8-14. Service Sheet 9, State Recognition Board A1 (Sheet 3 of 6)



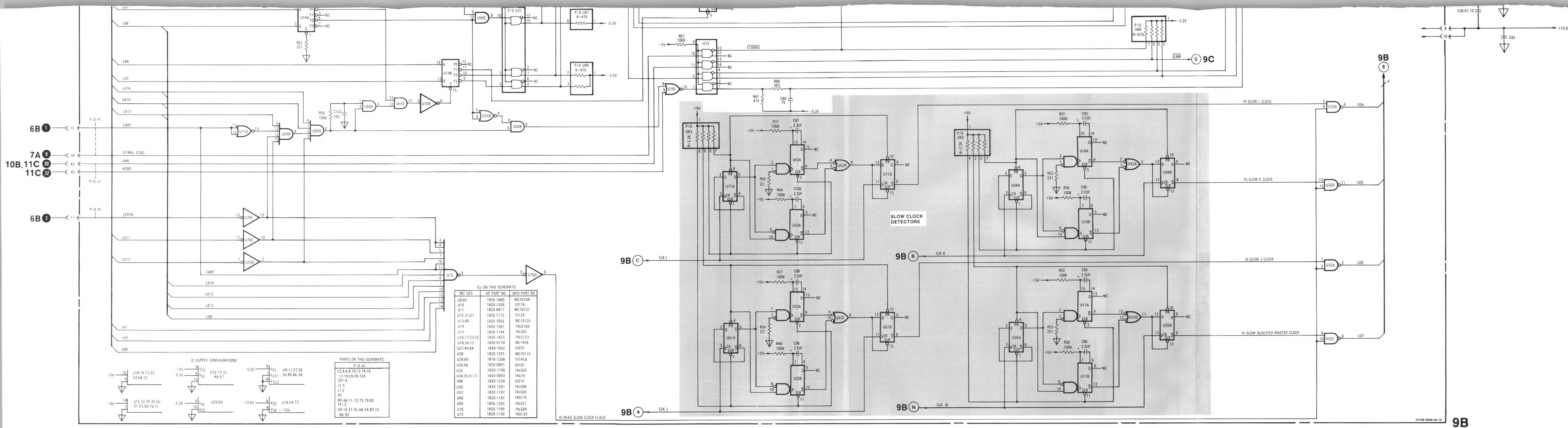
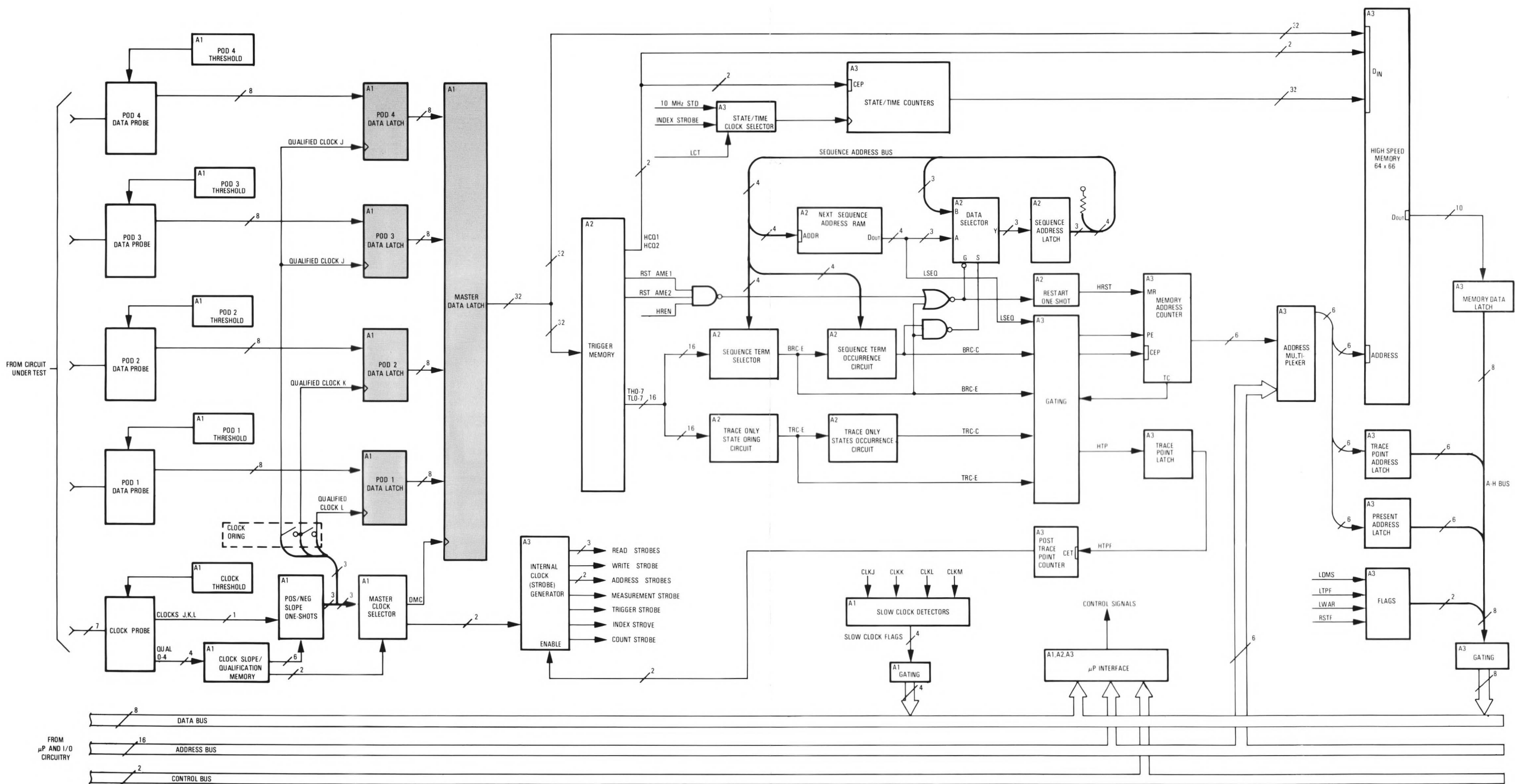


Figure 8-14.
Service Sheet 9, State Recognition Board A1 (Sheet 4 of 6)
8-53



Block Diagram, 1610B Data Acquisition Section

Figure 8-14. Service Sheet 9, State Recognition Board A1 (Sheet 5 of 6)

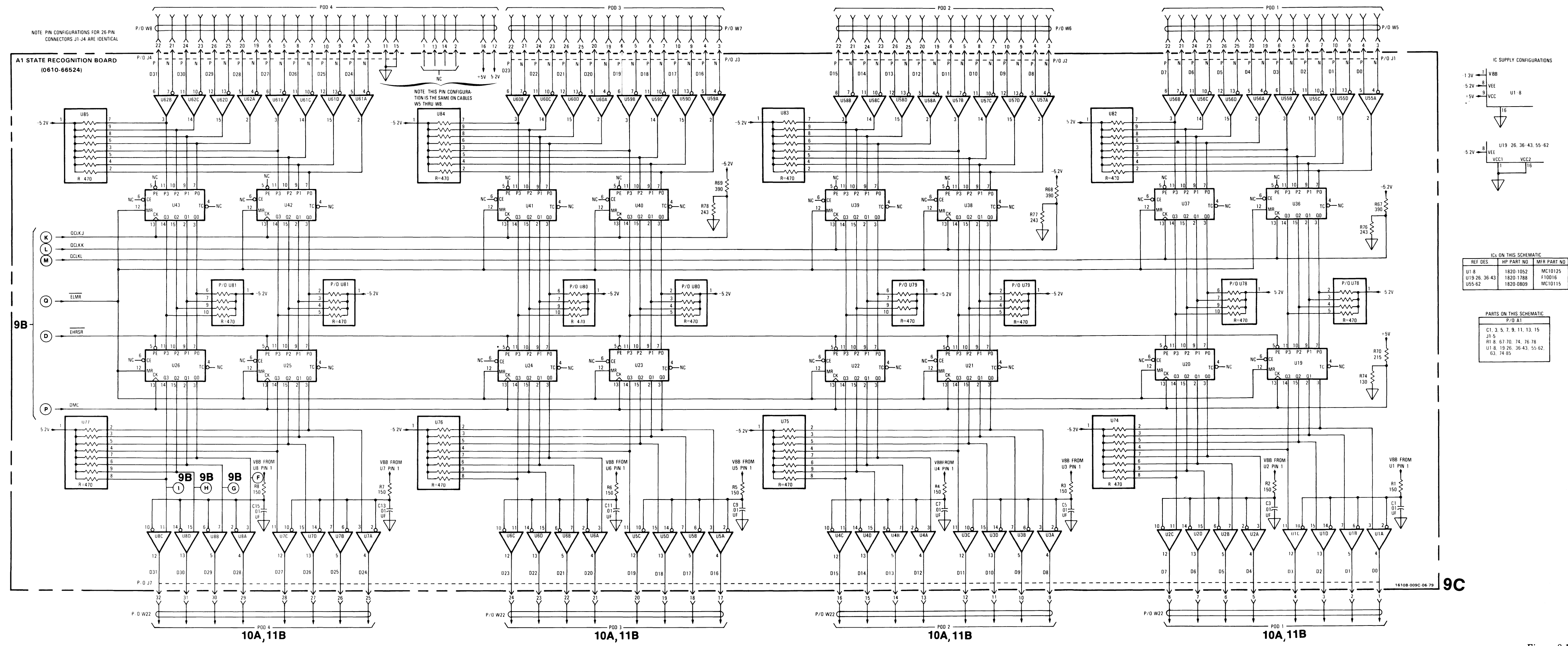
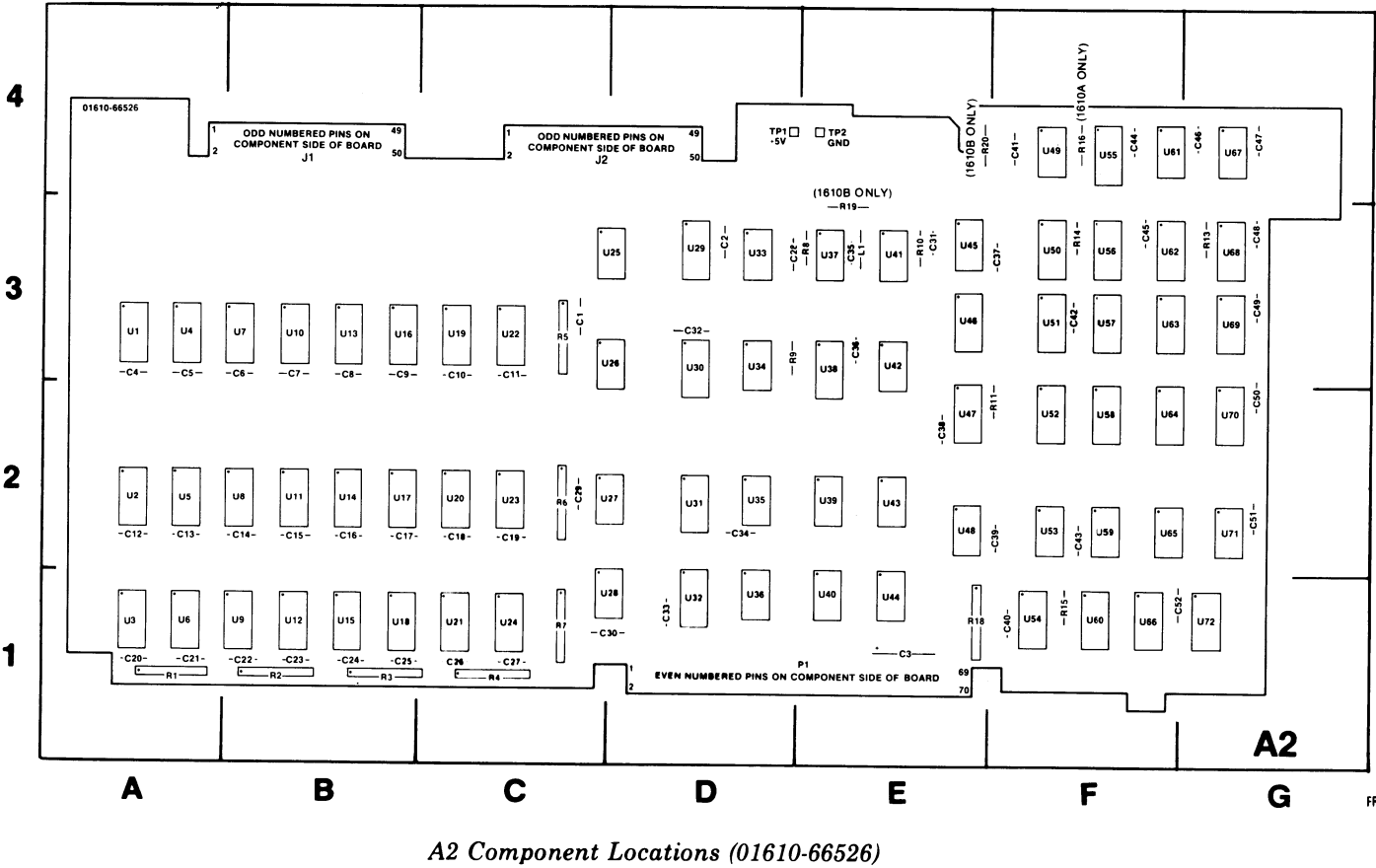
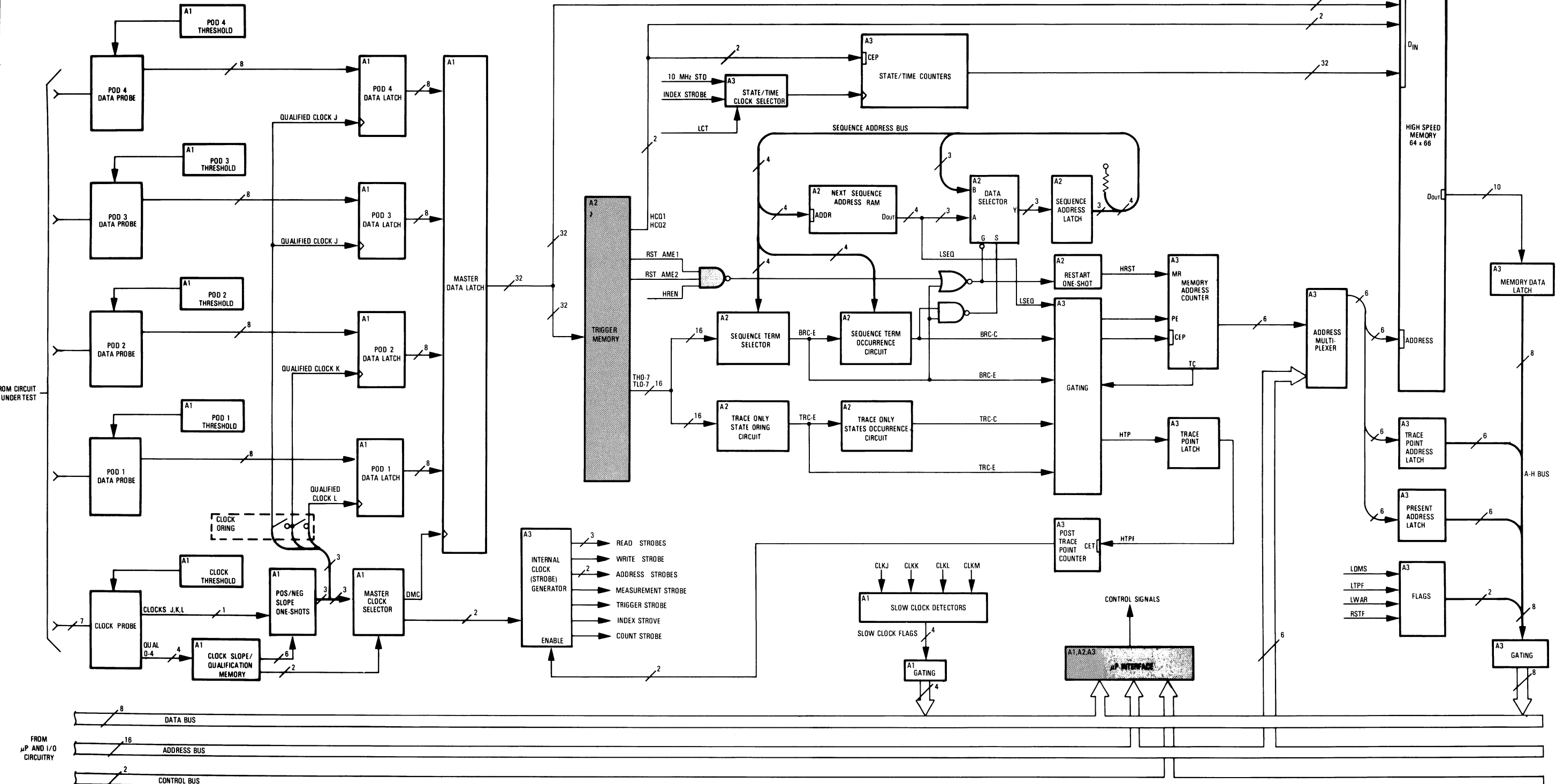


Figure 8-14.
Service Sheet 9, State Recognition Board A1 (Sheet 6 of 6)
8-55



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	C-3	C19	C-2	C38	E-2	R1	A-1	TP1	D-4	U18	B-1	U37	E-3	U56	F-3
C2	D-3	C20	A-1	C39	F-2	R2	B-1	TP2	E-4	U19	C-3	U38	E-3	U57	F-3
C3	E-1	C21	A-1	C40	F-1	R3	B-1	U1	A-3	U20	C-2	U39	E-2	U58	F-2
C4	A-3	C22	B-1	C41	F-4	R4	C-1	U2	A-2	U21	C-1	U40	E-1	U59	F-2
C5	A-3	C23	B-1	C42	F-3	R5	C-3	U3	A-1	U22	C-3	U41	E-3	U60	F-1
C6	B-3	C24	B-1	C43	F-2	R6	C-2	U4	A-3	U23	C-2	U42	E-3	U61	F-4
C7	B-3	C25	B-1	C44	F-4	R7	C-1	U5	A-2	U24	C-1	U43	E-2	U62	F-3
C8	B-3	C26	C-1	C45	F-3	R8	E-3	U6	A-1	U25	C-3	U44	E-1	U63	F-3
C9	B-3	C27	C-1	C46	G-4	R9	D-3	U7	B-3	U26	C-3	U45	E-3	U64	F-2
C10	C-3	C28	D-3	C47	G-4	R10	E-3	U8	B-2	U27	C-2	U46	E-3	U65	F-2
C11	C-3	C29	C-2	C48	G-3	R11	F-2	U9	B-1	U28	C-1	U47	E-2	U66	F-1
C12	A-2	C30	C-1	C49	G-3	R13	G-3	U10	B-3	U29	D-3	U48	E-2	U67	G-4
C13	A-2	C31	E-3	C50	G-2	R14	F-3	U11	B-2	U30	D-3	U49	F-4	U68	G-3
C14	B-2	C32	D-3	C51	G-2	R15	F-1	U12	B-1	U31	D-2	U50	F-3	U69	G-3
C15	B-2	C33	D-1	C52	F-1	R16	F-4	U13	B-3	U32	D-1	U51	F-3	U70	G-2
C16	B-2	C34	D-2	J1	B-4	R18	E-1	U14	B-2	U33	D-3	U52	F-2	U71	G-2
C17	B-2	C35	E-3	J2	C-4	R19	E-4	U15	B-1	U34	D-3	U53	F-2	U72	G-1
C18	C-2	C36	E-3	L1	E-3	R20	E-4	U16	B-3	U35	D-2	U54	F-1		
		C37	F-3	P1	E-1			U17	B-2	U36	D-1	U55	F-4		



Block Diagram, 1610B Data Acquisition Section

Figure 8-15. Service Sheet 10, Index Board A2 (Sheet 1 of 6)



8-57

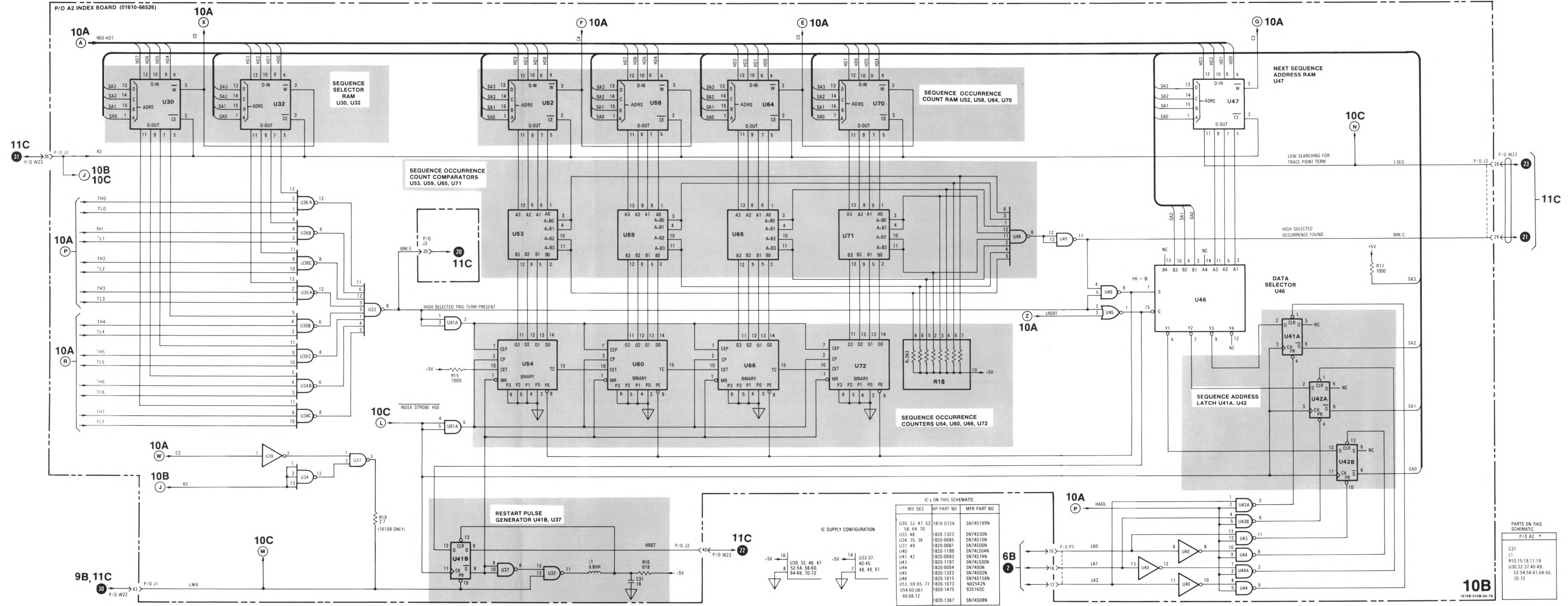
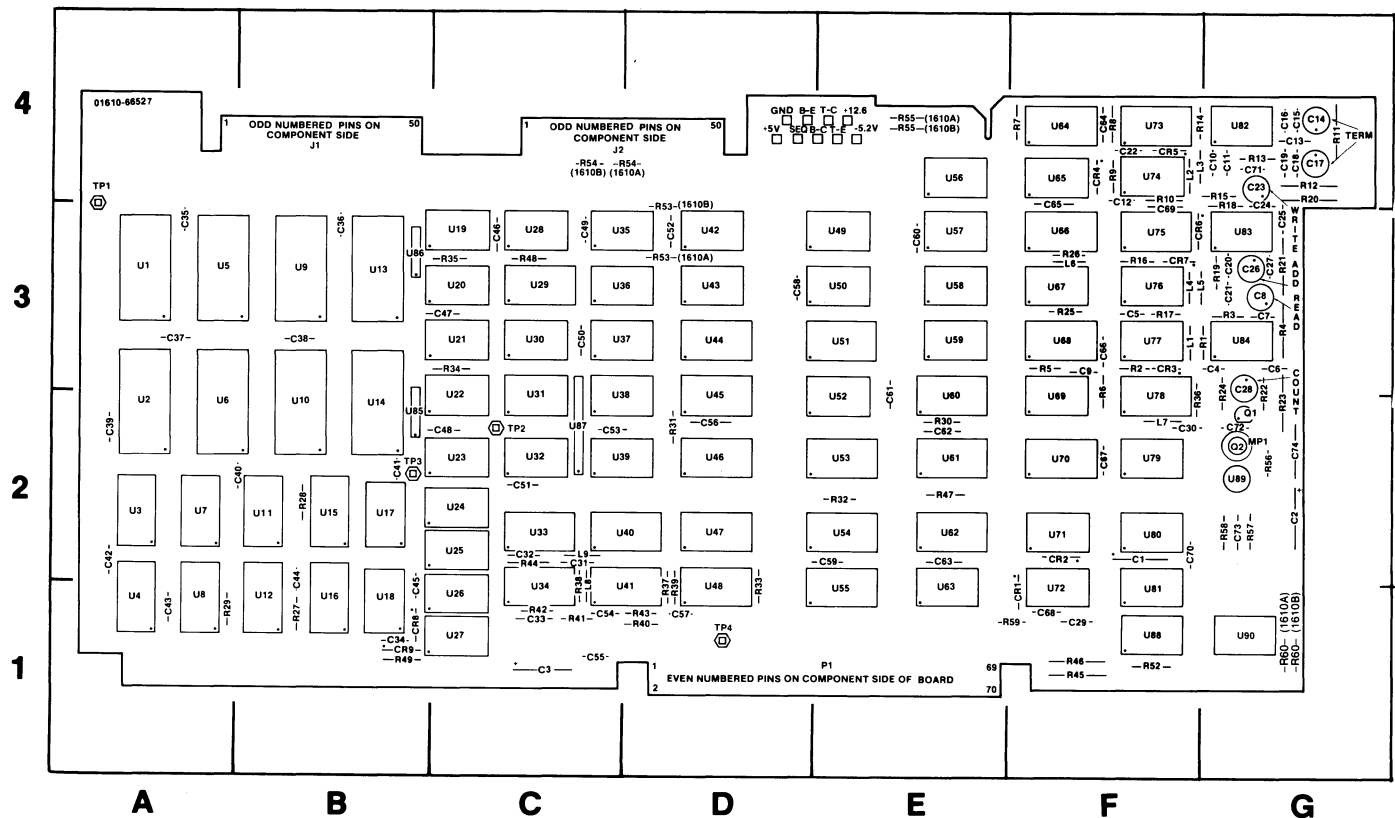


Figure 8-15.
Service Sheet 10, Index Board A2 (Sheet 4 of 6)
8-59

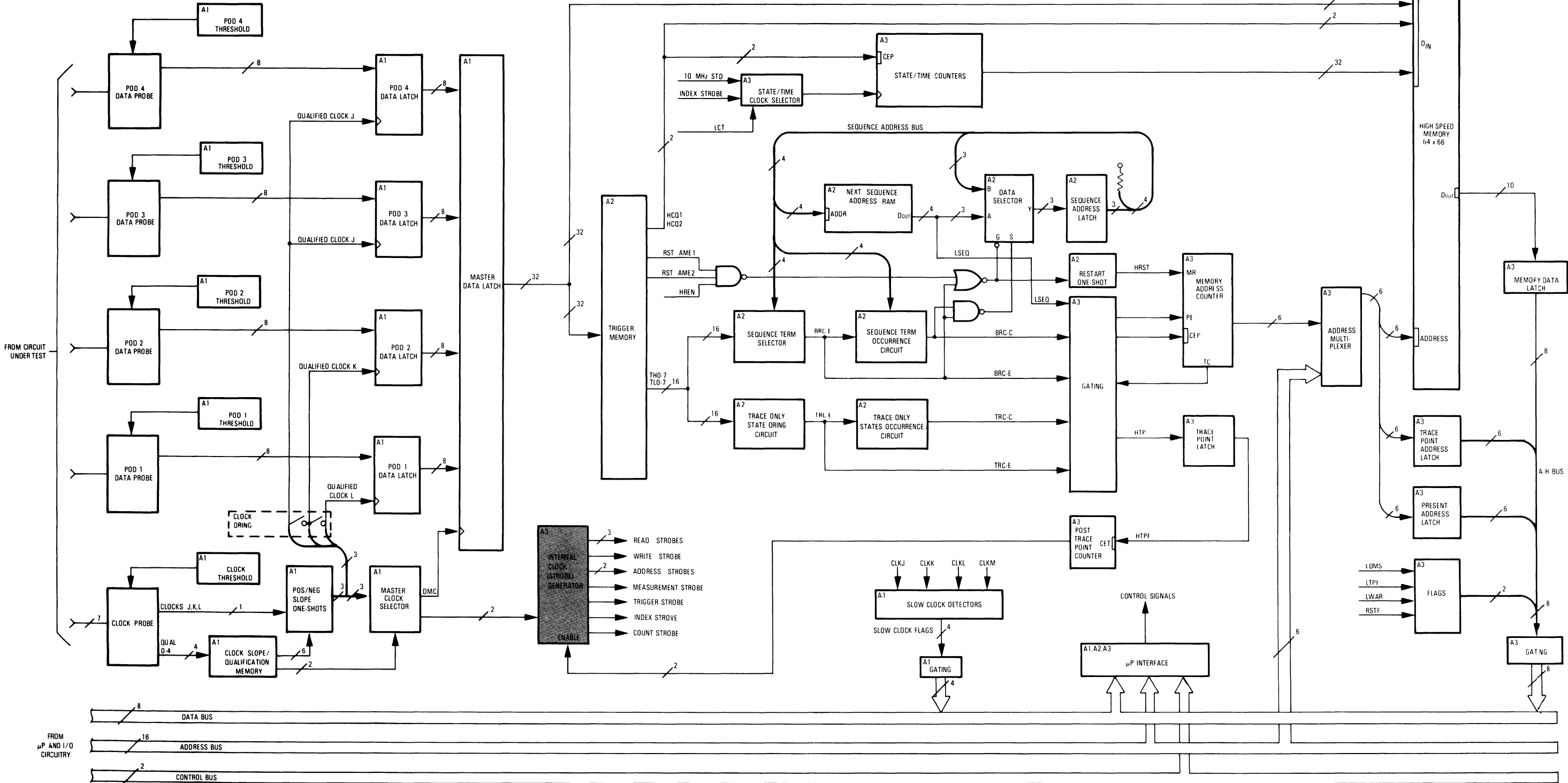


8-61



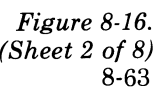
A3 Component Locations (01610-66527)

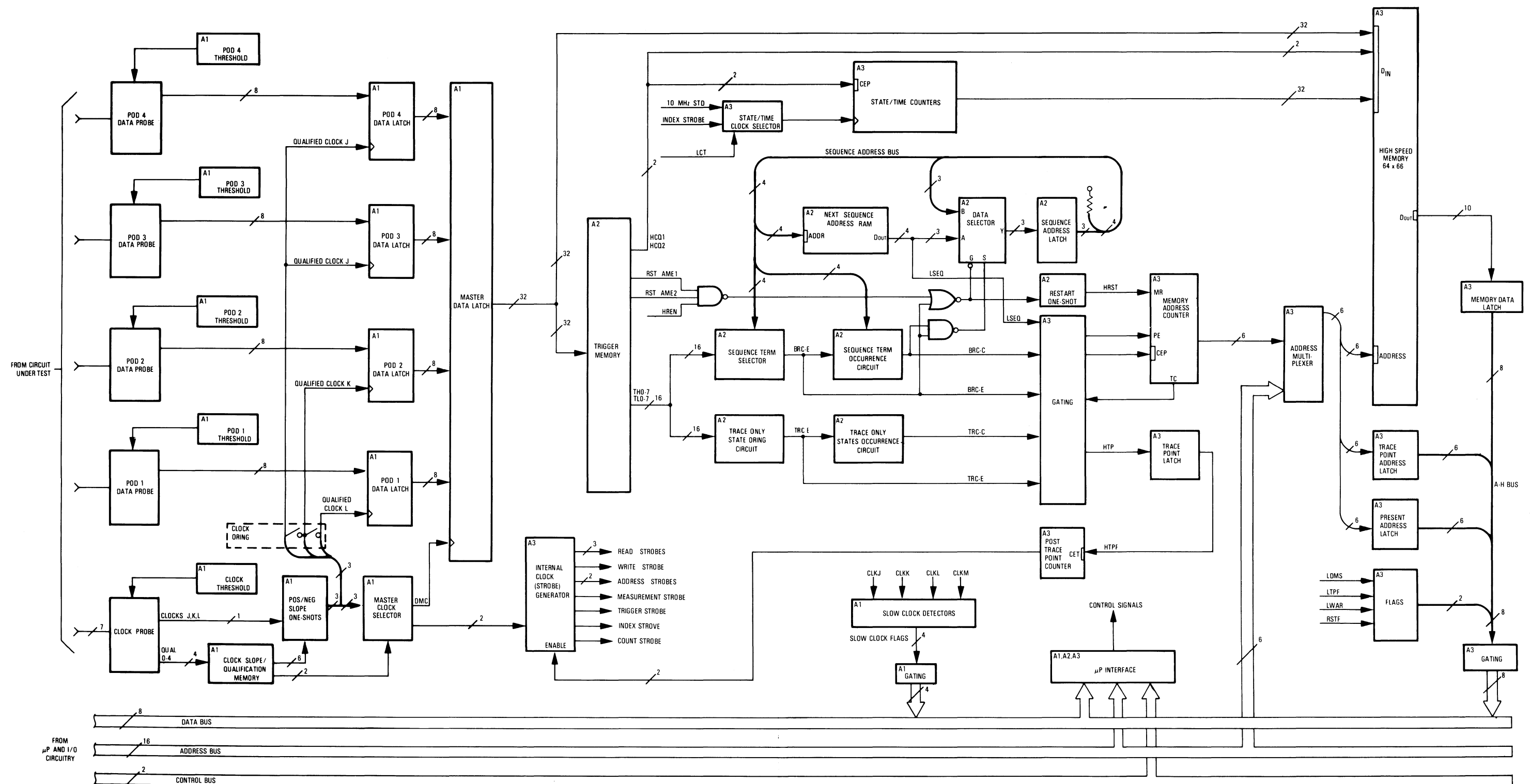
REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	F-2	C32	C-2	C63	E-2	L9	C-2	R27	B-1	TP1	A-4	U28	C-3	U59	E-3
C2	G-2	C33	C-1	C64	F-4	MP1	G-2	R28	B-2	TP2	C-2	U29	C-3	U60	E-2
C3	C-1	C34	B-1	C65	F-4	P1	E-1	R29	A-1	TP3	B-2	U30	C-3	U61	E-2
C4	G-3	C35	A-3	C66	F-3	Q1	G-2	R30	E-2	TP4	D-1	U31	C-2	U62	E-2
C5	F-3	C36	B-3	C67	F-2	Q2	G-2	R31	D-2	U1	A-3	U32	C-2	U63	E-1
C6	G-3	C37	A-3	C68	F-1	R1	G-3	R32	E-2	U2	A-2	U33	C-2	U64	F-4
C7	G-3	C38	B-3	C69	F-3	R2	F-3	R33	D-1	U3	A-2	U34	C-1	U65	F-4
C8	G-3	C39	A-2	C70	F-2	R3	G-3	R34	C-3	U4	A-1	U35	D-3	U66	F-3
C9	F-3	C40	A-2	C71	G-4	R4	G-3	R35	C-3	U5	A-3	U36	D-3	U67	F-3
C10	G-4	C41	B-2	C72	G-2	R5	F-3	R36	G-2	U6	A-2	U37	D-3	U68	F-3
C11	G-4	C42	A-2	C73	G-2	R6	F-3	R37	D-1	U7	A-2	U38	D-2	U69	F-2
C12	F-4	C43	A-1	C74	G-2	R7	F-4	R38	C-1	U8	A-1	U39	D-2	U70	F-2
C13	G-4	C44	B-2	CR1	F-1	R8	F-4	R39	D-1	U9	B-3	U40	D-2	U71	F-2
C14	G-4	C45	B-1	CR2	F-2	R9	F-4	R40	D-1	U10	B-2	U41	D-1	U72	F-1
C15	C-4	C46	C-3	CR3	F-3	R10	G-4	R41	C-1	U11	B-2	U42	D-3	U73	F-4
C16	G-4	C47	C-3	CR4	F-4	R11	G-4	R42	C-1	U12	B-1	U43	D-3	U74	F-4
C17	G-4	C48	C-2	CR5	F-4	R12	G-4	R43	D-1	U13	B-3	U44	D-3	U75	F-3
C18	G-4	C49	C-3	CR6	F-3	R13	G-4	R44	C-2	U14	B-2	U45	D-2	U76	F-3
C19	G-4	C50	C-3	CR7	F-3	R14	F-4	R45	F-1	U15	B-2	U46	D-2	U77	F-3
C20	G-3	C51	C-2	CR8	B-1	R15	G-4	R46	F-1	U16	B-1	U47	D-2	U78	F-2
C21	G-3	C52	D-3	CR9	B-1	R16	F-3	R47	E-2	U17	B-2	U48	D-1	U79	F-2
C22	F-4	C53	C-2	J1	B-4	R17	F-3	R48	C-3	U18	B-1	U49	E-3	U80	F-2
C23	G-4	C54	C-1	J2	C-4	R18	G-4	R49	B-1	U19	C-3	U50	E-3	U81	F-1
C24	G-4	C55	C-1	L1	F-3	R19	G-3	R52	F-1	U20	C-3	U51	E-3	U82	G-4
C25	G-3	C56	D-2	L2	F-4	R20	G-4	R53	D-3	U21	C-3	U52	E-2	U83	G-3
C26	G-3	C57	D-1	L3	F-4	R21	G-3	R54	C-4	U22	C-2	U53	E-2	U84	G-3
C27	G-3	C58	D-2	L4	F-3	R22	G-3	R55	E-4	U23	C-2	U54	E-2	U85	B-2
C28	G-3	C59	E-2	L5	G-3	R23	G-2	R56	G-2	U24	C-2	U55	E-1	U86	B-3
C29	F-1	C60	E-3	L6	F-3	R24	G-2	R57	G-2	U25	C-2	U56	E-4	U87	C-2
C30	F-2	C61	E-2	L7	F-2	R25	F-3	R58	G-2	U26	C-1	U57	E-3	U88	F-1
C31	C-1	C62	E-2	L8	C-1	R26	F-3	R59	F-1	U27	C-1	U58	E-3	U89	G-2
						R60	G-1		G-1			U90			G-1



Block Diagram, 1610B Data Acquisition Section

Figure 8-16. Service Sheet 11, Measurement Board A3 (Sheet 1 of 8)





Block Diagram, 1610B Data Acquisition Section

Figure 8-16. Service Sheet 11, Measurement Board A3 (Sheet 3 of 8)

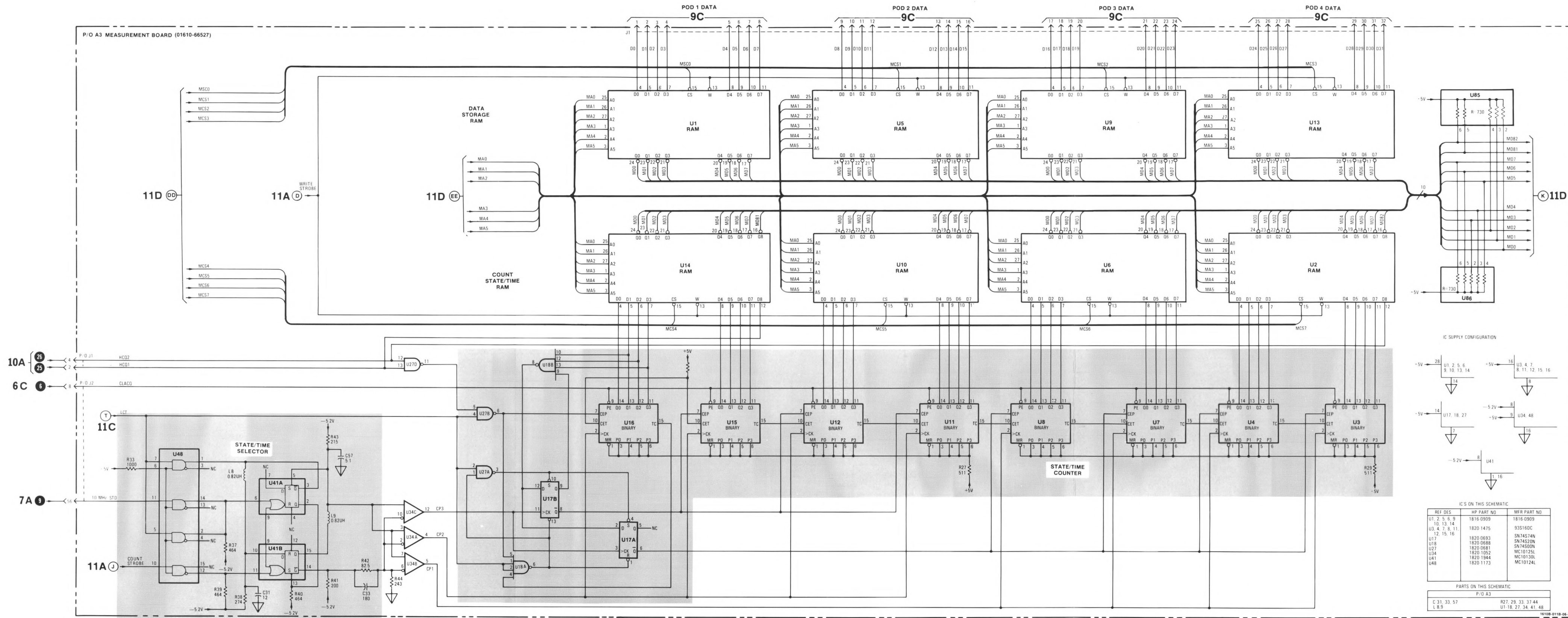
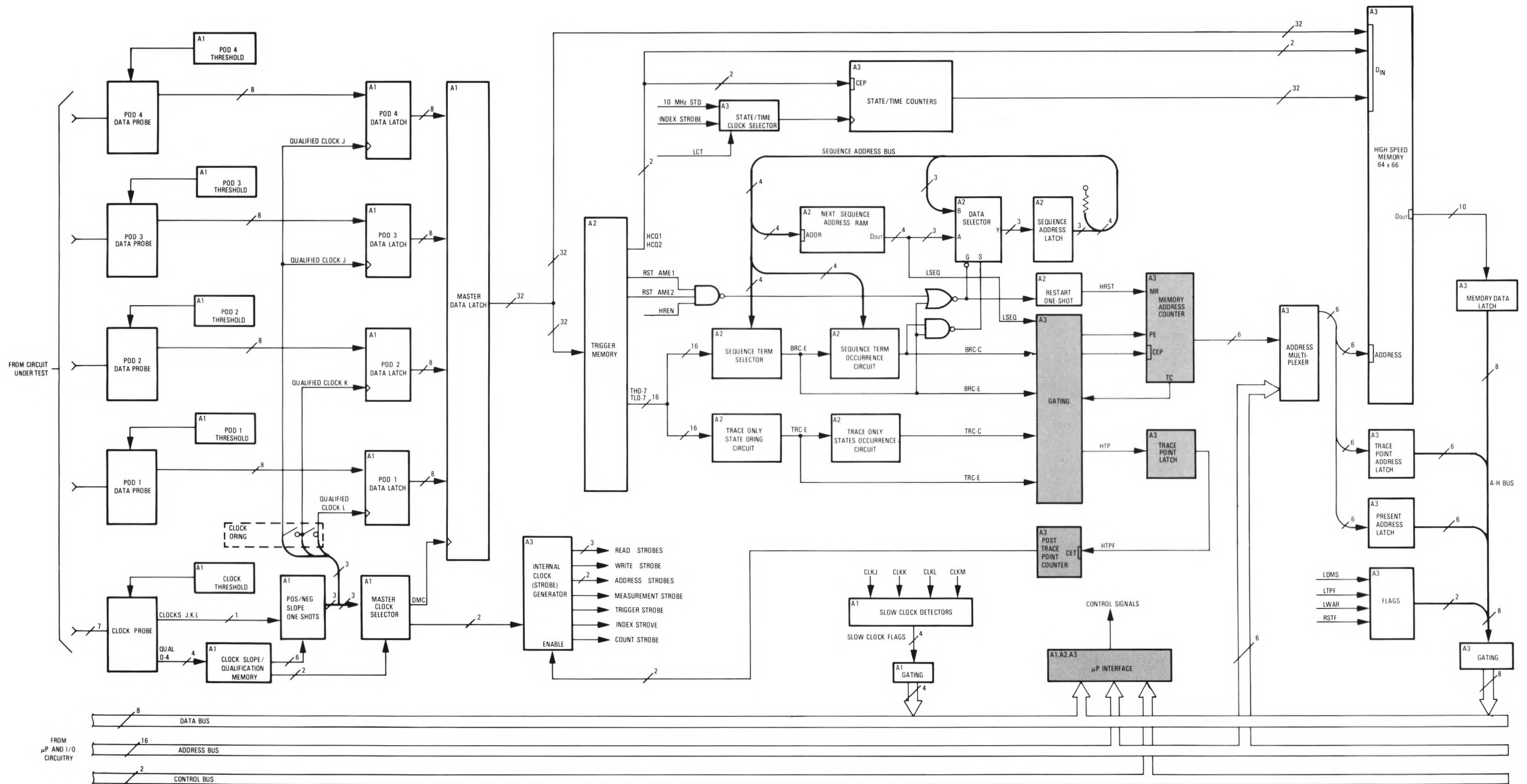


Figure 8-16.
Service Sheet 11, Measurement Board A3 (Sheet 4 of 8)
8-65



Block Diagram, 1610B Data Acquisition Section

Figure 8-16. Service Sheet 11, Measurement Board A3 (Sheet 5 of 8)



Figure 8-16.
Service Sheet 11, Measurement Board A3 (Sheet 6 of 8)
8-67



8-68

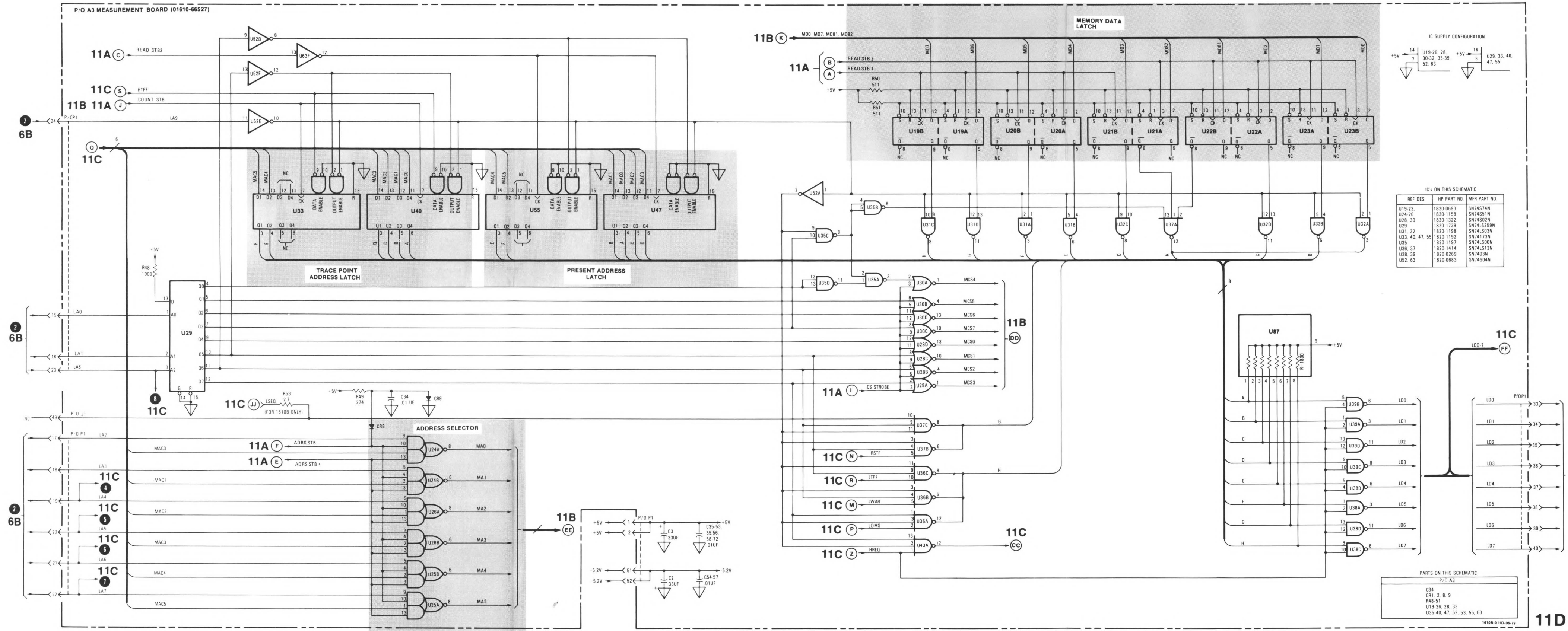
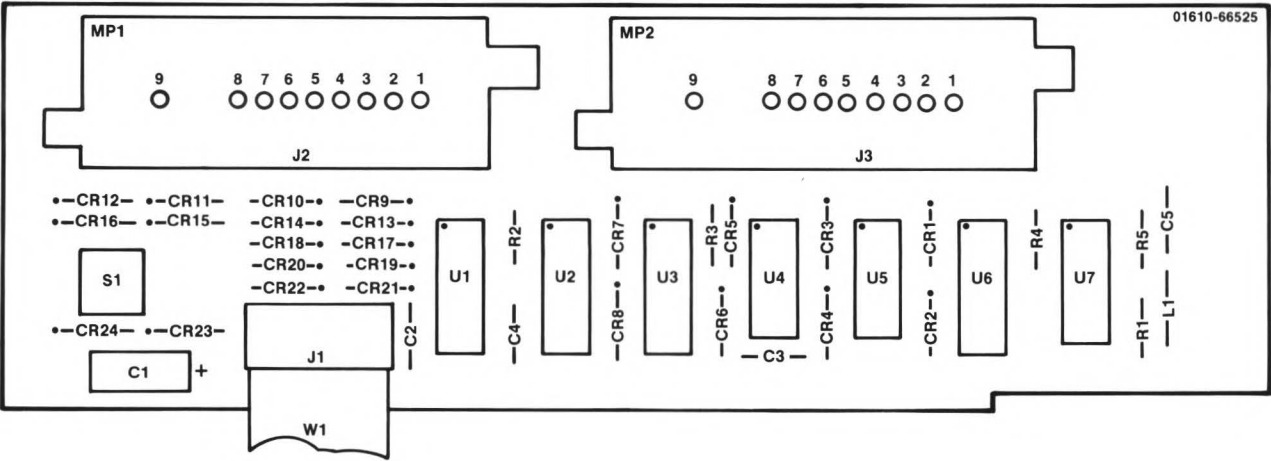
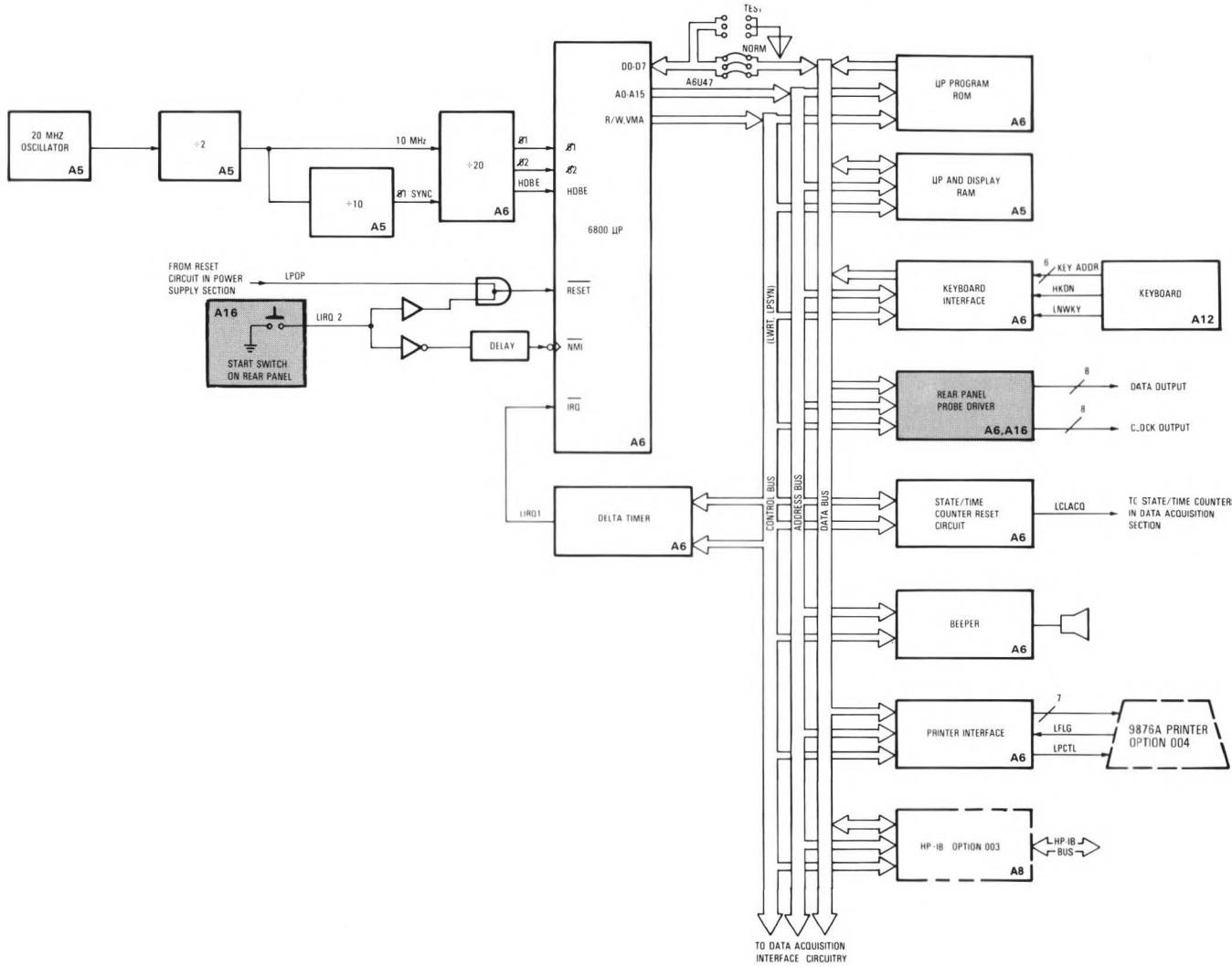


Figure 8-16.
Service Sheet 11, Measurement Board A3 (Sheet 8 of 8)
8-69



A16 Component Locations (01610-66525)



Block Diagram, 1610B Control and I/O Section

Figure 8-17. Service Sheet 12, Probe Driver Board A16 (Sheet 1 of 2)

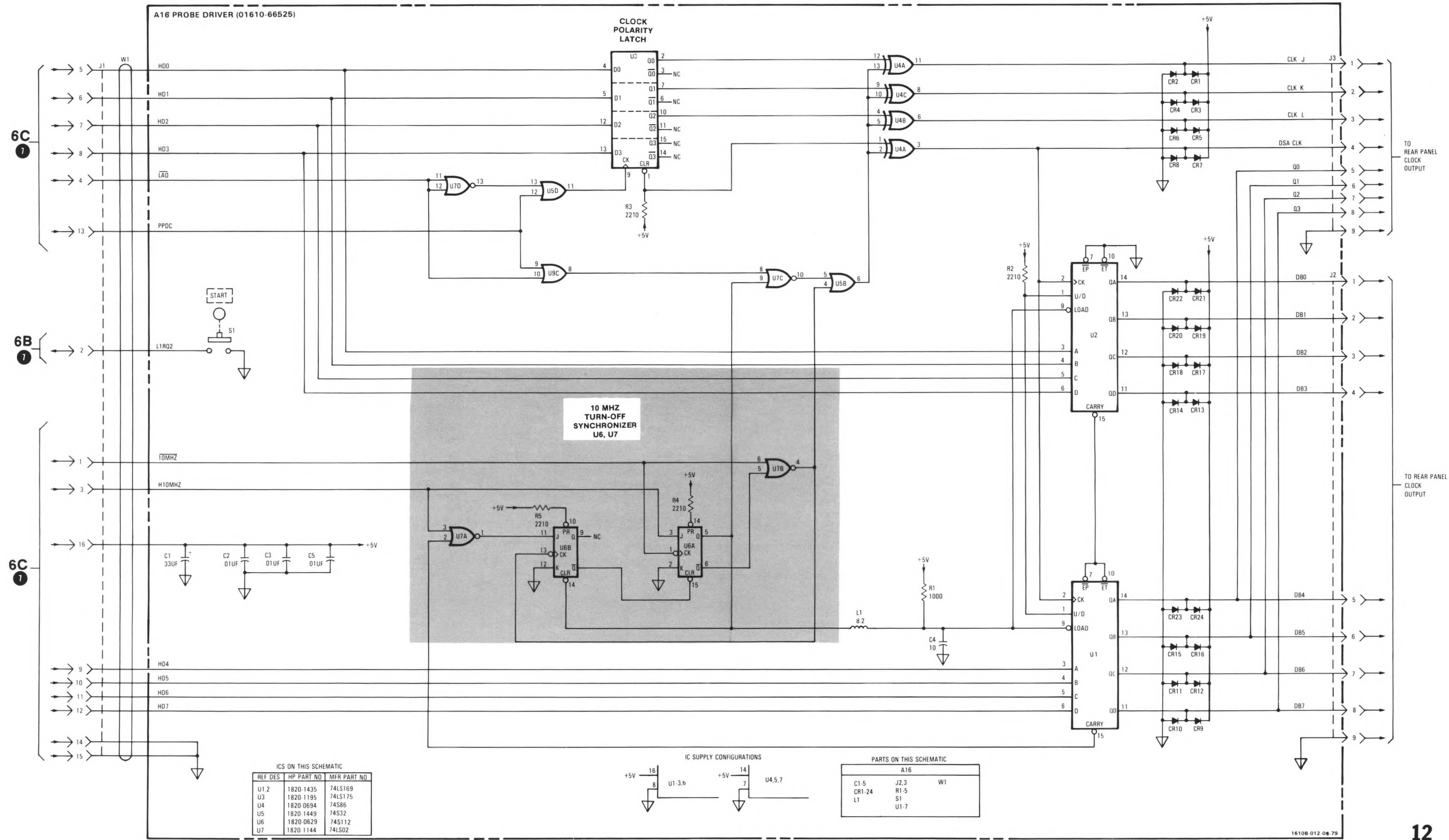


Figure 8-17.
Service Sheet 12, Probe Driver Board A16 (Sheet 2 of 2)
8-71



AFRICA, ASIA, AUSTRALIA

ANGOLA

Telectra
Empresa Técnica de Equipamentos
Eléctricos, S.A.R.L.
R. Barbosa Rodrigues, 41-1°DT.°
Caixa Postal, 6487
Luanda
Tel: 35515/6
Cable: TELETRA Luanda

AUSTRALIA

Hewlett-Packard Australia Pty. Ltd.
31-41 Joseph Street
Blackburn, Victoria 3130
P.O. Box 36
Doncaster East,
Victoria 3109
Tel: 896351
Telex: 31-024
Cable: HEWPARD Melbourne

Hewlett-Packard Australia Pty. Ltd.
31 Bridge Street
Pymble
New South Wales, 2073
Tel: 4496566
Telex: 21561
Cable: HEWPARD Sydney

Hewlett-Packard Australia Pty. Ltd.
153 Greenhill Road
Parkside, S.A., 5063
Tel: 2725911
Telex: 82536
Cable: HEWPARD Adelaide

Hewlett-Packard Australia Pty. Ltd.
141 Stirling Highway
Nedlands, W.A. 6009
Tel: 3865455
Telex: 93859
Cable: HEWPARD Perth

Hewlett-Packard Australia Pty. Ltd.
121 Wollongong Street
Fyshwick, A.C.T. 2609
Tel: 804244
Telex: 62650
Cable: HEWPARD Canberra
Hewlett-Packard Australia Pty. Ltd.
5th Floor
Teachers Union Building
495-499 Boundary Street
Spring Hill, Queensland 4000
Tel: 2291544
Cable: HEWPARD Brisbane

BANGLADESH

The General Electric Co. of Bangladesh Ltd.
Magnet House 72
Dilkusha Commercial Area
Motijheel, Dacca 2
Tel: 252415, 252419
Telex: 734
Cable: GECDAC Dacca

ETHIOPIA

Abdella Abdulmaik
P.O. Box 2635
Addis Ababa
Tel: 11 93 40

GUAM

Guam Medical Supply, Inc.
Suite C, Airport Plaza
P.O. Box 8947
Tamuning 96911
Tel: 646-4513
Cable: EARMED Guam

HONG KONG

Hewlett-Packard Hong Kong Ltd.
Room 105, Austin Centre
1st Floor
21 Austin Avenue
TST P.O. Box 98524
Kowloon
Tel: 3-697446 (5 lines)
Telex: 36678 HX
Cable: HEWPACK Hong Kong
Medical/Analytical Only
Schmidt & Co. (Hong Kong) Ltd.
Wing On Centre, 28th Floor
Connaught Road, C.

Hong Kong

Tel: 5-455644
Telex: 74766 SCHMX HX
INDIA
Blue Star Ltd.
Sahas
414/2 Vir Savarkar Marg
Prabhadevi

Bombay

400 025
Tel: 45 78 87
Telex: 011-4093
Cable: FROSTBLUE
Blue Star Ltd.
Band Box House
Prabhadevi

Bombay

400 025
Tel: 45 73 01
Telex: 011-3751
Cable: BLUESTAR
Blue Star Ltd.
Bhavdeep
Shadium Road

Ahmedabad

380 014
Tel: 43922
Telex: 012-234
Cable: BLUEFROST
Blue Star Ltd.
Mito Mitsui Building
91 Nehru Place

New Delhi

110 024
Tel: 682547
Telex: 031-2463
Cable: BLUESTAR
Blue Star Ltd.
T.C. 7/603 'Poornima'
Maruthankuzhi

Trivandrum

695 013
Tel: 65799
Telex: 0884-259
Cable: BLUESTAR
Blue Star Ltd.
11 Magarath Road
Bangalore 560 025
Tel: 55868
Cable: BLUESTAR

Kenya

ADCOM Ltd., Inc.
P.O. Box 30070
Nairobi
Tel: 331955
Telex: 22639
Medical Only
International Aeradio (E.A.) Ltd.
P.O. Box 19012
Nairobi Airport

Nairobi

Tel: 336055/56
Telex: 22201/22301
Cable: INTAERIO Nairobi
Blue Star Ltd.
1-1-117/1 Sarojini Devi Road
Secunderabad 500 033
Tel: 70126
Telex: 0155-459
Cable: BLUESTAR

Blue Star Ltd.

133 Kodambakkam High Road
Room 105, Austin Centre
1st Floor
21 Austin Avenue
TST P.O. Box 98524
Kowloon
Tel: 3-697446 (5 lines)
Telex: 36678 HX
Cable: HEWPACK Hong Kong

INDONESIA

BERCA Indonesia P.T.
P.O. Box 496/Jkt.
Jln. Abdul Muis 62
Jakarta
Tel: 349255, 349886
Telex: 46748 BERSIL IA
Cable: BERSAL
BERCA Indonesia P.T.
P.O. Box 174/Sby.
23 Jln. Jimerto

Surabaya

Tel: 42027
Cable: BERCACON
JAPAN
Yokogawa-Hewlett-Packard Ltd.
29-21, Takaide-Higashi 3-chome
Suginami-ku, **Tokyo** 168
Tel: 03-331-6111
Telex: 232-2024 YHP-Tokyo
Cable: YHPMARKET TOK 23 724

Yokogawa-Hewlett-Packard Ltd.

Chuo Bldg., 4th Floor
4-20, Nishinakajima 5-chome
Yodogawa-ku, Osaka-shi
Osaka, 532
Tel: 06-304-6021
Telex: 523-3624
Yokogawa-Hewlett-Packard Ltd.
Sunitomo Seimei Nagaya Bldg.
11-2 Shimosasajima-cho,
Nakamura-ku, **Nagoya**, 450
Tel: 052 571-5171

Yokogawa-Hewlett-Packard Ltd.

Tanigawa Building
2-24-1 Tsuruya-cho
Kanagawa-ku
Yokohama, 221
Tel: 045-312-1252
Telex: 382-3204 YHP YOK
Yokogawa-Hewlett-Packard Ltd.
Mito Mitsui Building
105, 1-chome, San-no-maru
Mito, Ibaragi 310
Tel: 0292-25-7470

Yokogawa-Hewlett-Packard Ltd.

Inoue Building
1348-3, Asahi-cho, 1-chome
T.C. 7/603 'Poornima'
Maruthankuzhi
Trivandrum 695 013
Tel: 65799
Telex: 0884-259
Cable: BLUESTAR
Blue Star Ltd.
T.C. 7/603 'Poornima'
Maruthankuzhi

Trivandrum

695 013
Tel: 65799
Telex: 0884-259
Cable: BLUESTAR
Blue Star Ltd.
T.C. 7/603 'Poornima'
Maruthankuzhi
Trivandrum 695 013
Tel: 65799
Telex: 0884-259
Cable: BLUESTAR

Blue Star Ltd.

11 Magarath Road
Bangalore 560 025
Tel: 55868
Cable: BLUESTAR
Blue Star Ltd.
T.C. 7/603 'Poornima'
Maruthankuzhi
Trivandrum 695 013
Tel: 65799
Telex: 0884-259
Cable: BLUESTAR

Blue Star Ltd.

11 Magarath Road
Bangalore 560 025
Tel: 55868
Cable: BLUESTAR
Blue Star Ltd.
T.C. 7/603 'Poornima'
Maruthankuzhi
Trivandrum 695 013
Tel: 65799
Telex: 0884-259
Cable: BLUESTAR

Blue Star Ltd.

11 Magarath Road
Bangalore 560 025
Tel: 55868
Cable: BLUESTAR
Blue Star Ltd.
T.C. 7/603 'Poornima'
Maruthankuzhi
Trivandrum 695 013
Tel: 65799
Telex: 0884-259
Cable: BLUESTAR

Blue Star Ltd.

11 Magarath Road
Bangalore 560 025
Tel: 55868
Cable: BLUESTAR
Blue Star Ltd.
T.C. 7/603 'Poornima'
Maruthankuzhi
Trivandrum 695 013
Tel: 65799
Telex: 0884-259
Cable: BLUESTAR

Blue Star Ltd.

11 Magarath Road
Bangalore 560 025
Tel: 55868
Cable: BLUESTAR
Blue Star Ltd.
T.C. 7/603 'Poornima'
Maruthankuzhi
Trivandrum 695 013
Tel: 65799
Telex: 0884-259
Cable: BLUESTAR

Blue Star Ltd.

11 Magarath Road
Bangalore 560 025
Tel: 55868
Cable: BLUESTAR
Blue Star Ltd.
T.C. 7/603 'Poornima'
Maruthankuzhi
Trivandrum 695 013
Tel: 65799
Telex: 0884-259
Cable: BLUESTAR

Medical Only

International Aeradio (E.A.) Ltd.
P.O. Box 95221
Madras 600 034
Mombasa
KOREA
Samsung Electronics Co., Ltd.
22nd Floor Dongbang Bldg.,
250, 2-KA, Taepyung-Ro
Chung-Ku,
Seoul
Tel: 777-4886
Telex: 31231 TEIL NG
Cable: THETIEL Ibadan

THE ELECTRONICS

Instrumentations Ltd.
144 Agege Motor Road, Mushin
P.O. Box 481
Mushin, **Lagos**
Cable: THETIEL Lagos
PAKISTAN
Mushko & Company Ltd.
Oosman Chambers
Abdullah Haroon Road
Karachi-3
Tel: 511027, 512927
Telex: 2894
Cable: COOPERATOR Karachi
Mushko & Company, Ltd.
10, Bazar Rd.
Sector G-6/4
Islamabad
Tel: 28264
Cable: FEMUS Rawalpindi

PHILIPPINES

The Online Advanced Systems
Corporation
Rico House
Amorsolo cor. Herrera Str.
Legaspi Village, Makati
P.O. Box 1510
Metro **Manila**
Tel: 85-35-81, 85-34-91, 85-32-21
Telex: 3274 ONLINE
RHODESIA
Field Technical Sales
45 Kelvin Road North
P.O. Box 3458
Salisbury
Tel: 705231 (5 lines)
Telex: RH 4122

SINGAPORE

Hewlett-Packard Singapore
(Pte.) Ltd.
1150 Depot Road
P.O. Box 58
Alexandra Post Office
Singapore 3
Tel: 270-2355
Telex: HPSG RS 21486
Cable: HEWPACK, Singapore
SOUTH AFRICA
Hewlett-Packard South Africa
(Pty.), Ltd.
Private Bag Wendywood,
Sandton, Transvaal, 2144
Hewlett-Packard Centre
Daphne Street, Wendywood,
Sandton, 2144
Tel: 802-5111/25
Telex: 8-4782
Cable: HEWPACK Johannesburg
Hewlett-Packard South Africa
(Pty.), Ltd.
P.O. Box 120
Howard Place,
Cape Province, 7450
Pine Park Centre, Forest Drive,
Pinelands,
Cape Province, 7405
Tel: 53-7955 thru 9
Telex: 57-0006

NEW ZEALAND

Hewlett-Packard (N.Z.) Ltd.
4-12 Cruickshank Street
Kilbirnie, Wellington 3
P.O. Box 9443
Courtney Place
Wellington
Tel: 877-199
Cable: HEWPACK Wellington
Hewlett-Packard (N.Z.) Ltd.
P.O. Box 26-189
169 Manukau Road
Epsom, **Auckland**
Tel: 687-159
Cable: HEWPACK Auckland
Analytical/Medical Only
Northrup Instruments &
Systems Ltd.,
Sturdee House
85-87 Ghuznee Street
P.O. Box 2406
Wellington
Tel: 850-091
Telex: NZ 31291
Northrup Instruments &
Systems Ltd.
Eden House, 44 Khyber Pass Rd.
P.O. Box 9682, Newmarket
Auckland 1
Tel: 794-091
Northrup Instruments &
Systems Ltd.
Terrace House, 4 Oxford Terrace
P.O. Box 8388
Christchurch
Tel: 64-165

NEW ZEALAND

Hewlett-Packard (N.Z.) Ltd.
4-12 Cruickshank Street
Kilbirnie, Wellington 3
P.O. Box 9443
Courtney Place
Wellington
Tel: 877-199
Cable: HEWPACK Wellington
Hewlett-Packard (N.Z.) Ltd.
P.O. Box 26-189
169 Manukau Road
Epsom, **Auckland**
Tel: 687-159
Cable: HEWPACK Auckland
Analytical/Medical Only
Northrup Instruments &
Systems Ltd.,
Sturdee House
85-87 Ghuznee Street
P.O. Box 2406
Wellington
Tel: 850-091
Telex: NZ 31291
Northrup Instruments &
Systems Ltd.
Eden House, 44 Khyber Pass Rd.
P.O. Box 9682, Newmarket
Auckland 1
Tel: 794-091
Northrup Instruments &
Systems Ltd.
Terrace House, 4 Oxford Terrace
P.O. Box 8388
Christchurch
Tel: 64-165

NEW ZEALAND

Hewlett-Packard (N.Z.) Ltd.
4-12 Cruickshank Street
Kilbirnie, Wellington 3
P.O. Box 9443
Courtney Place
Wellington
Tel: 877-199
Cable: HEWPACK Wellington
Hewlett-Packard (N.Z.) Ltd.
P.O. Box 26-189
169 Manukau Road
Epsom, **Auckland**
Tel: 687-159
Cable: HEWPACK Auckland
Analytical/Medical Only
Northrup Instruments &
Systems Ltd.,
Sturdee House
85-87 Ghuznee Street
P.O. Box 2406
Wellington
Tel: 850-091
Telex: NZ 31291
Northrup Instruments &
Systems Ltd.
Eden House, 44 Khyber Pass Rd.
P.O. Box 9682, Newmarket
Auckland 1
Tel: 794-091
Northrup Instruments &
Systems Ltd.
Terrace House, 4 Oxford Terrace
P.O. Box 8388
Christchurch
Tel: 64-165

NEW ZEALAND

Hewlett-Packard (N.Z.) Ltd.
4-12 Cruickshank Street
Kilbirnie, Wellington 3
P.O. Box 9443
Courtney Place
Wellington
Tel: 877-199
Cable: HEWPACK Wellington
Hewlett-Packard (N.Z.) Ltd.
P.O. Box 26-189
169 Manukau Road
Epsom, **Auckland**
Tel: 687-159
Cable: HEWPACK Auckland
Analytical/Medical Only
Northrup Instruments &
Systems Ltd.,
Sturdee House
85-87 Ghuznee Street
P.O. Box 2406
Wellington
Tel: 850-091
Telex: NZ 31291
Northrup Instruments &
Systems Ltd.
Eden House, 44 Khyber Pass Rd.
P.O. Box 9682, Newmarket
Auckland 1
Tel: 794-091
Northrup Instruments &
Systems Ltd.
Terrace House, 4 Oxford Terrace
P.O. Box 8388
Christchurch
Tel: 64-165

NEW ZEALAND

Hewlett-Packard (N.Z.) Ltd.
4-12 Cruickshank Street
Kilbirnie, Wellington 3
P.O. Box 9443
Courtney Place
Wellington
Tel: 877-199
Cable: HEWPACK Wellington
Hewlett-Packard (N.Z.) Ltd.
P.O. Box 26-189
169 Manukau Road
Epsom, **Auckland**
Tel: 687-159
Cable: HEWPACK Auckland
Analytical/Medical Only
Northrup Instruments &
Systems Ltd.,
Sturdee House
85-87 Ghuznee Street
P.O. Box 2406
Wellington
Tel: 850-091
Telex: NZ 31291
Northrup Instruments &
Systems Ltd.
Eden House, 44 Khyber Pass Rd.
P.O. Box 9682, Newmarket
Auckland 1
Tel: 794-091
Northrup Instruments &
Systems Ltd.
Terrace House, 4 Oxford Terrace
P.O. Box 8388
Christchurch
Tel: 64-165

NEW ZEALAND

Hewlett-Packard (N.Z.) Ltd.
4-12 Cruickshank Street
Kilbirnie, Wellington 3
P.O. Box 9443
Courtney Place
Wellington
Tel: 877-199
Cable: HEWPACK Wellington
Hewlett-Packard (N.Z.) Ltd.
P.O. Box 26-189
169 Manukau Road
Epsom, **Auckland**
Tel: 687-159
Cable: HEWPACK Auckland
Analytical/Medical Only
Northrup Instruments &
Systems Ltd.,
Sturdee House
85-87 Ghuznee Street
P.O. Box 2406
Wellington
Tel: 850-091
Telex: NZ 31291
Northrup Instruments &
Systems Ltd.
Eden House, 44 Khyber Pass Rd.
P.O. Box 9682, Newmarket
Auckland 1
Tel: 794-091
Northrup Instruments &
Systems Ltd.
Terrace House, 4 Oxford Terrace
P.O. Box 8388
Christchurch
Tel: 64-165

NEW ZEALAND

Hewlett-Packard (N.Z.) Ltd.
4-12 Cruickshank Street
Kilbirnie, Wellington 3
P.O. Box 9443
Courtney Place
Wellington
Tel: 877-199
Cable: HEWPACK Wellington
Hewlett-Packard (N.Z.) Ltd.
P.O. Box 26-189
169 Manukau Road
Epsom, **Auckland**
Tel: 687-159
Cable: HEWPACK Auckland
Analytical/Medical Only
Northrup Instruments &
Systems Ltd.,
Sturdee House
85-87 Ghuznee Street
P.O. Box 2406
Wellington
Tel: 850-091
Telex: NZ 31291
Northrup Instruments &
Systems Ltd.
Eden House, 44 Khyber Pass Rd.
P.O. Box 9682, Newmarket
Auckland 1
Tel: 794-091
Northrup Instruments &
Systems Ltd.
Terrace House, 4 Oxford Terrace
P.O. Box 8388
Christchurch
Tel: 64-165

NEW ZEALAND

Hewlett-Packard (N.Z.) Ltd.
4-12 Cruickshank Street
Kilbirnie, Wellington 3
P.O. Box 9443
Courtney Place
Wellington
Tel: 877-199
Cable: HEWPACK Wellington
Hewlett-Packard (N.Z.) Ltd.
P.O. Box 26-189
169 Manukau Road
Epsom, **Auckland**
Tel: 687-159
Cable: HEWPACK Auckland
Analytical/Medical Only
Northrup Instruments &
Systems Ltd.,
Sturdee House
85-87 Ghuznee Street
P.O. Box 2406
Wellington
Tel: 850-091
Telex: NZ 31291
Northrup Instruments &
Systems Ltd.
Eden House, 44 Khyber Pass Rd.
P.O. Box 9682, Newmarket
Auckland 1
Tel: 794-091
Northrup Instruments &
Systems Ltd.
Terrace House, 4 Oxford Terrace
P.O. Box 8388
Christchurch
Tel: 64-165

NEW ZEALAND

Hewlett-Packard (N.Z.) Ltd.
4-12 Cruickshank Street
Kilbirnie, Wellington 3
P.O. Box 9443
Courtney Place
Wellington
Tel: 877-199
Cable: HEWPACK Wellington
Hewlett-Packard (N.Z.) Ltd.
P.O. Box 26-189
169 Manukau Road
Epsom, **Auckland**
Tel: 687-159
Cable: HEWPACK Auckland
Analytical/Medical Only
Northrup Instruments &
Systems Ltd.,
Sturdee House
85-87 Ghuznee Street
P.O. Box 2406
Wellington
Tel: 850-091
Telex: NZ 31291
Northrup Instruments &
Systems Ltd.
Eden House, 44 Khyber Pass Rd.
P.O. Box 9682, Newmarket
Auckland 1
Tel: 794-091
Northrup Instruments &
Systems Ltd.
Terrace House, 4 Oxford Terrace
P.O. Box 8388
Christchurch
Tel: 64-165

NIGERIA

The Electronics
Instrumentations Ltd.
N68/770 Oyo Road
Oluseun House
P.M.B. 5402
Ibadan
Tel: 461577
Telex: 31231 TEIL NG
Cable: THETIEL Ibadan
The Electronics
Instrumentations Ltd.
144 Agege Motor Road, Mushin
P.O. Box 481
Mushin, **Lagos**
Cable: THETIEL Lagos
PAKISTAN
Mushko & Company Ltd.
Oosman Chambers
Abdullah Haroon Road
Karachi-3
Tel: 511027, 512927
Telex: 2894
Cable: COOPERATOR Karachi
Mushko & Company, Ltd.
10, Bazar Rd.
Sector G-6/4
Islamabad
Tel: 28264
Cable: FEMUS Rawalpindi

PHILIPPINES

The Online Advanced Systems
Corporation
Rico House
Amorsolo cor. Herrera Str.
Legaspi Village, Makati
P.O. Box 1510
Metro **Manila**
Tel: 85-35-81, 85-34-91, 85-32-21
Telex: 3274 ONLINE
RHODESIA
Field Technical Sales
45 Kelvin Road North
P.O. Box 3458
Salisbury
Tel: 705231 (5 lines)
Telex: RH 4122

SINGAPORE

Hewlett-Packard Singapore
(Pte.) Ltd.
1150 Depot Road
P.O. Box 58
Alexandra Post Office
Singapore 3
Tel: 270-2355
Telex: HPSG RS 21486
Cable: HEWPACK, Singapore
SOUTH AFRICA
Hewlett-Packard South Africa
(Pty.), Ltd.
Private Bag Wendywood,
Sandton, Transvaal, 2144
Hewlett-Packard Centre
Daphne Street, Wendywood,
Sandton, 2144
Tel: 802-5111/25
Telex: 8-4782
Cable: HEWPACK Johannesburg
Hewlett-Packard South Africa
(Pty.), Ltd.
P.O. Box 120
Howard Place,
Cape Province, 7450
Pine Park Centre, Forest Drive,
Pinelands,
Cape Province, 7405
Tel: 53-7955 thru 9
Telex: 57-0006

NEW ZEALAND

Hewlett-Packard (N.Z.) Ltd.
4-12 Cruickshank Street
Kilbirnie, Wellington 3
P.O. Box 9443
Courtney Place
Wellington
Tel: 877-199
Cable: HEWPACK Wellington
Hewlett-Packard (N.Z.) Ltd.
P.O. Box 26-189
169 Manukau Road
Epsom, **Auckland**
Tel: 687-159
Cable: HEWPACK Auckland
Analytical/Medical Only
Northrup Instruments &
Systems Ltd.,
Sturdee House
85-87 Ghuznee Street
P.O. Box 2406
Wellington
Tel: 850-091
Telex: NZ 31291
Northrup Instruments &
Systems Ltd.
Eden House, 44 Khyber Pass Rd.
P.O. Box 9682, Newmarket
Auckland 1
Tel: 794-091
Northrup Instruments &
Systems Ltd.
Terrace House, 4 Oxford Terrace
P.O. Box 8388
Christchurch
Tel: 64-165

NEW ZEALAND

Hewlett-Packard (N.Z.) Ltd.
4-12 Cruickshank Street
Kilbirnie, Wellington 3
P.O. Box 9443
Courtney Place
Wellington
Tel: 877-199
Cable: HEWPACK Wellington
Hewlett-Packard (N.Z.) Ltd.
P.O. Box 26-189
169 Manukau Road
Epsom, **Auckland**
Tel: 687-159
Cable: HEWPACK Auckland
Analytical/Medical Only
Northrup Instruments &
Systems Ltd.,
Sturdee House
85-87 Ghuznee Street
P.O. Box 2406
Wellington
Tel: 850-091
Telex: NZ 31291
Northrup Instruments &
Systems Ltd.
Eden House, 44 Khyber Pass Rd.
P.O. Box 9682, Newmarket
Auckland 1
Tel: 794-091
Northrup Instruments &
Systems Ltd.
Terrace House, 4 Oxford Terrace
P.O. Box 8388
Christchurch
Tel: 64-165

NEW ZEALAND

Hew



SALES OFFICES

AFRICA, ASIA, AUSTRALIA

ANGOLA

Telectra
Empresa Técnica de Equipamentos
Eléctricos, S.A.R.L.
R. Barbosa Rodrigues, 41-1° DT. °
Caixa Postal, 6487
Luanda
Tel: 35515/6
Cable: TELETRA Luanda

AUSTRALIA

Hewlett-Packard Australia Pty. Ltd.
31-41 Joseph Street
Blackburn, Victoria 3130
P.O. Box 36
Doncaster East,
Victoria 3109
Tel: 896351
Telex: 31-024
Cable: HEWPARD Melbourne

Hewlett-Packard Australia Pty. Ltd.
31 Bridge Street

Pymble

New South Wales, 2073
Tel: 4496566
Telex: 21561
Cable: HEWPARD Sydney

Hewlett-Packard Australia Pty. Ltd.
153 Greenhill Road

Parkside, S.A., 5063

Tel: 2725911
Telex: 82536
Cable: HEWPARD Adelaide

Hewlett-Packard Australia Pty. Ltd.
141 Stirling Highway

Nedlands, W.A. 6009

Tel: 3865455
Telex: 93859
Cable: HEWPARD Perth

Hewlett-Packard Australia Pty. Ltd.
121 Wollongong Street

Fyshwick, A.C.T. 2609

Tel: 804244
Telex: 62650
Cable: HEWPARD Canberra

Hewlett-Packard Australia Pty. Ltd.
5th Floor

Teachers Union Building
495-499 Boundary Street

Spring Hill, Queensland 4000

Tel: 2291544
Cable: HEWPARD Brisbane

BANGLADESH

The General Electric Co. of
Bangladesh Ltd.

Magnet House 72

Dilkusha Commercial Area
Motijholla, Dacca 2

Tel: 252415, 252419
Telex: 734
Cable: GECDAC Dacca

ETHIOPIA

Abdella Abdulmaik
P.O. Box 2635

Addis Ababa

Tel: 11 93 40

GUAM

Guam Medical Supply, Inc.
Suite C, Airport Plaza

P.O. Box 8947

Tamuning 96911

Tel: 646-4513
Cable: EARMED Guam

HONG KONG

Hewlett-Packard Hong Kong Ltd.
Room 105, Austin Centre

1st Floor

21 Austin Avenue

TST P.O. Box 98524

Kowloon

Tel: 3-697446 (5 lines)
Telex: 36678 HX
Cable: HEWPACK Hong Kong

Medical/Analytical Only
Schmidt & Co. (Hong Kong) Ltd.

Wing On Centre, 28th Floor
Connaught Road, C.

Hong Kong

Tel: 5-455644
Telex: 74766 SCHMX HX

INDIA

Blue Star Ltd.
Sahas

414/2 Vir Savarkar Marg
Prabhadevi

Bombay 400 025
Tel: 45 78 87
Telex: 011-4093

Cable: FROSTBLUE

Blue Star Ltd.

Band Box House
Prabhadevi

Bombay 400 025
Tel: 45 73 01
Telex: 011-3751

Cable: BLUESTAR

Blue Star Ltd.
Bhavdeep

Stadium Road
Ahmedabad 380 014

Tel: 43922
Telex: 012-234
Cable: BLUEFROST

Blue Star Ltd.
7 Hare Street

Calcutta 700 001
Tel: 23-0131
Telex: 045-312-1252

Cable: BLUESTAR

Blue Star Ltd.
Bhandari House

91 Nehru Place
New Delhi 110 024

Tel: 682547
Telex: 031-2463
Cable: BLUESTAR

Blue Star Ltd.
T.C. 7/603 'Poornima'

Maruthankuzhi
Trivandrum 695 013

Tel: 65799
Telex: 0884-259
Cable: BLUESTAR

Blue Star Ltd.
11 Magarath Road

Bangalore 560 025
Tel: 55868
Telex: 0845-430

Cable: BLUESTAR

Blue Star Ltd.
Meeakshi Mandiram

XXXXV/1379-2 Mahatma
Gandhi Rd.

Cochin 682 016
Tel: 32069
Telex: 085-514

Cable: BLUESTAR

Blue Star Ltd.
1-1-117/1 Sarojini Devi Road

Secunderabad 500 033
Tel: 70126
Telex: 0155-459

Cable: BLUESTAR

Blue Star Ltd.
133 Kodambakkam High Road

Room 105, Austin Centre
Madras 600 034

Tel: 82057
Telex: 041-379
Cable: BLUESTAR

INDONESIA
BERCA Indonesia P.T.

P.O. Box 496/Jkt.
Jln. Abdul Muis 62

Jakarta
Tel: 349255, 349886
Telex: 46748 BERSIL IA

Cable: BERSAL

BERCA Indonesia P.T.
P.O. Box 174/Sby.

23 Jln. Jimerto
Surabaya

Tel: 42027
Cable: BERCACACON

JAPAN
Yokogawa-Hewlett-Packard Ltd.

29-21, Takaide-Higashi 3-chome
Suginami-ku, **Tokyo** 168

Tel: 03-331-6111
Telex: 232-2024 YHP-Tokyo

Cable: YHPMARKET TOK 23 724

Yokogawa-Hewlett-Packard Ltd.
Chuo Bldg., 4th Floor

4-20, Nishinakajima 5-chome
Yodogawa-ku, Osaka-shi

Osaka, 532
Tel: 06-304-6021
Telex: 523-3624

Yokogawa-Hewlett-Packard Ltd.
Sunitomo Seimei Nagaya Bldg.

11-2 Shimosasajima-cho,
Nakamura-ku, **Nagoya**, 450

Tel: 052 571-5171

Yokogawa-Hewlett-Packard Ltd.
Tanigawa Building

2-24-1 Tsuruya-cho
Kanagawa-ku

Yokohama, 221
Tel: 045-312-1252
Telex: 382-3204 YHP YOK

Yokogawa-Hewlett-Packard Ltd.
Mito Mitsui Building

105, 1-chome, San-no-maru
Mito, Ibaragi 310

Tel: 0292-25-7470

Yokogawa-Hewlett-Packard Ltd.
Inoue Building

1348-3, Asahi-cho, 1-chome
Atsugi, Kanagawa 243

Tel: 0462-24-0452

Yokogawa-Hewlett-Packard Ltd.
Kumagaya Asahi

Hachijuni Building
4th Floor

3-4, Tsukuba
Kumagaya, Saitama 360

Tel: 0485-24-6563

KENYA
ADCOM Ltd., Inc.

P.O. Box 30070
Nairobi

Tel: 331955
Telex: 22639

Medical Only
International Aeradio (E.A.) Ltd.

Northrup Instruments &
Systems Ltd.

Eden House, 44 Khyber Pass Rd.
P.O. Box 9682, Newmarket

Auckland 1
Tel: 794-091

Medical Only
International Aeradio (E.A.) Ltd.

P.O. Box 95221
Mombasa

KOREA
Samsung Electronics Co., Ltd.

22nd Floor Dongbang Bldg.,
250, 2-KA, Taepyeong-Ro

Chung-Ku,
Seoul

Tel: 777-4886
Telex: SAMSAN 27364

MALAYSIA
Hewlett-Packard Sales

(Malaysia) Sdn. Bhd.
Suite 2.21/2.22

Bangunan Angkasa Raya
Jalan Ampang

Kuala Lumpur
Tel: 483680, 485653

Protel Engineering
P.O. Box 1917

Lot 259, Satok Road
Kuching, **Sarawak**

Tel: 53544
Cable: PROTELENG

MOZAMBIQUE
A.N. Goncalves, Ltd.

162, 1° Apt. 14 Av. D. Luis
Caixa Postal 107

Maputo
Tel: 27091, 27114

Telex: 6-203 NEGON Mo
Cable: NEGON

NEW GUINEA
Hewlett-Packard Australia Pty. Ltd.

Development Bank Building
Ground Floor

Ward Strip
Port Moresby, Papua

Tel: 258933

NEW ZEALAND
Hewlett-Packard (N.Z.) Ltd.

4-12 Cruickshank Street
Kilbirnie, Wellington 3

P.O. Box 9443
Courtney Place

Wellington
Tel: 877-199

Cable: HEWPACK Wellington

Hewlett-Packard (N.Z.) Ltd.
P.O. Box 26-189

169 Manukau Road
Epsom, **Auckland**

Tel: 687-159
Cable: HEWPACK Auckland

Analytical/Medical Only
Northrup Instruments &
Systems Ltd.,

Sturdee House
85-87 Ghuznee Street

P.O. Box 2406
Wellington

Tel: 850-091
Telex: NZ 31291

Northrup Instruments &
Systems Ltd.

Eden House, 44 Khyber Pass Rd.
P.O. Box 9682, Newmarket

Auckland 1
Tel: 794-091

Northrup Instruments &
Systems Ltd.

Terrace House, 4 Oxford Terrace
P.O. Box 8388

Christchurch
Tel: 64-165

NIGERIA

The Electronics
Instrumentations Ltd.

N6B/770 Oyo Road
Oluseun House

P.M.B. 5402
Ibadan

Tel: 461577
Telex: 31231 TEIL NG

Cable: THETIEL Ibadan

The Electronics
Instrumentations Ltd.

144 Agege Motor Road, Mushin
P.O. Box 481

Mushin, **Lagos**
Cable: THETIEL Lagos

PAKISTAN
Mushko & Company Ltd.

Oosman Chambers
Abdullah Haroon Road

Karachi-3
Tel: 511027, 512927

Telex: 2894
Cable: COOPERATOR Karachi

Mushko & Company, Ltd.
10, Bazar Rd.

Sector G-6/4
Islamabad

Tel: 28264
Cable: FEMUS Rawalpindi

PHILIPPINES
The Online Advanced Systems

Corporation
Rico House

Amorsolo cor. Herrera Str.
Legaspi Village, Makati

P.O. Box 1510
Metro **Manila**

Tel: 85-35-81, 85-34-91, 85-32-21
Telex: 3274 ONLINE

RHODESIA
Field Technical Sales

45 Kelvin Road North
P.O. Box 3458

Salisbury
Tel: 705231 (5 lines)

Telex: RH 4122

SINGAPORE
Hewlett-Packard Singapore

(Pte.) Ltd.
1150 Depot Road

P.O. Box 58
Alexandra Post Office

Singapore 3
Tel: 270-2355

Telex: HPSG RS 21486
Cable: HEWPACK, Singapore

SOUTH AFRICA
Hewlett-Packard South Africa

(Pty.), Ltd.
Private Bag Wendywood,

Sandton, Transvaal, 2144
Hewlett-Packard Centre

Daphne Street, Wendywood,
Sandton, 2144

Tel: 802-5111/25
Telex: 8-4782

Cable: HEWPACK Johannesburg

Hewlett-Packard South Africa
(Pty.), Ltd.

P.O. Box 120
Howard Place,

Cape Province, 7450
Pine Park Centre, Forest Drive,

Pinelands,
Cape Province, 7405

Tel: 53-7955 thru 9
Telex: 57-0006

SRI LANKA

Metropolitan Agencies Ltd.
209/9 Union Place

Colombo 2
Tel: 35947

Telex: 1377METROLTD CE
Cable: METROLTD

SUDAN
Radison Trade

P.O. Box 921
Khartoum

Tel: 44048
Telex: 375

TAIWAN
Hewlett-Packard Far East Ltd.

Taiwan Branch
Bank Tower, 5th Floor

205 Tun Hsu North Road
Taipei

Tel: (02) 751-0404 (15 lines)
Cable: HEWPACK TAIPEI

Hewlett-Packard Far East Ltd.
Taiwan Branch

68-2, Chung Cheng 3rd. Road
Kaohsiung

Tel: (07) 242318-Kaohsiung

Analytical Only
San Kwang Instruments Co., Ltd.

20 Yung Sui Road
Taipei

Tel: 3615446-9 (4 lines)
Telex: 22894 SANKWANG

Cable: SANKWANG Taipei

TANZANIA
Medical Only

International Aeradio (E.A.), Ltd.
P.O. Box 861

Dar es Salaam
Tel: 21251 Ext. 265

Telex: 41030

THAILAND
UNIMESA Co. Ltd.

Elcom Research Building
2538 Sukumvit Ave.

Bangchak, Bangkok
Tel: 3932387, 3930338

Cable: UNIMESA Bangkok

ZAMBIA
R.J. Tilbury (Zambia) Ltd.

P.O. Box 2792
Lusaka

Tel: 73793
Cable: ARJAYTEE, Lusaka

OTHER AREAS NOT LISTED,

CONTACT:
Hewlett-Packard Intercontinental

3495 Deer Creek Road
Palo Alto, California 94304

Tel: (415) 856-1501
TWX: 910-373-1267

Cable: HEWPACK Palo Alto
Telex: 034-8300, 034-8493

CANADA

ALBERTA
Hewlett-Packard (Canada) Ltd.

11620A - 168th Street
Edmonton T5M 3T9

Tel: (403) 452-3670
Telex: 610-831-2431

Hewlett-Packard (Canada) Ltd.
210, 7220 Fisher St. S.E.

Calgary T2H 2H8
Tel: (403) 253-2713

Telex: 610-821-6141

BRITISH COLUMBIA
Hewlett-Packard (Canada) Ltd.

